COAL AGE

Vol. 2 NEW YORK, OCTOBER 12, 1912 No. 15

THE question of reversing a mine-ventilating fan is a serious one, especially when there are men underground whose lives may be endangered by such action.

Notwithstanding the fact that many competent colliery officials believe there are times when the situation in a mine demands an immediate change in the direction of the air, other men of equal experience assert with the same positiveness that under no circumstances should the reversal of the air current be considered.

There are men of long experience in the management of mines who do not hesitate to say that a fan should never be built so that it *can* be reversed at the will of some fool foreman who might lose his head in an emergency, and decide that it was necessary to change the ventilating current, when so doing would, perhaps, sacrifice the lives of 50 or 100 helpless men who were depending on their knowledge of the course of the air.

The air current in a mine is the LIFE LINE, as truly as the flow of the blood through the arteries and veins is the thread of life in the body. It is important, beyond a doubt, that workers in the narrow confines of an underground development should be protected by all means or devices known to man. Preservation of life is first in everyone's mind; but *HOW CAN IT BE SECURED*?

No reliable manager or superintendent would consider, for a single moment, the question of the increased outlay for a reversible fan when convinced that a single life might be saved thereby. It is not a question of expense but rather one of what constitutes the safest practice. How shall the life line be maintained?

This is a question that should be discussed broadly, to determine whether it is the opinion of the majority of coal-mining men that fans *should* or *should not* be built reversible.

It is probable that colliery officials always will differ in their judgment on some matters of importance, and will vary in their opinion as to the best course to adopt in the face of danger. But to fail to equip a large mine with a reversible fan would leave only one way open, in case the emergency arose demanding a choice.

Granted that conditions in a mine may, for a time, make man powerless to help his unfortunate comrades who are for such time beyond human aid; does this fact warrant the previous curtailing of the means at his disposal to render such aid as may be required?

Granted, again, that the course of the ventilating current should be maintained in its regular channels, as far as practicable, does this decision warrant the previous assumption that no condition *could* arise in a mine that would require the reversal of the current, as the ONLY way out to safety.

This is the question we ask COAL AGE men to debate. Let us have a full, free and fearless discussion.

The Arkansas Semi Anthracite Field

By A. H. Shaw*

The Arkansas "anthracites" occupy a unique geographical position which places them on a comparatively noncompetitive basis. The production is limited and the market covers a broad territory. The field has been the scene of extensive stripping operations.

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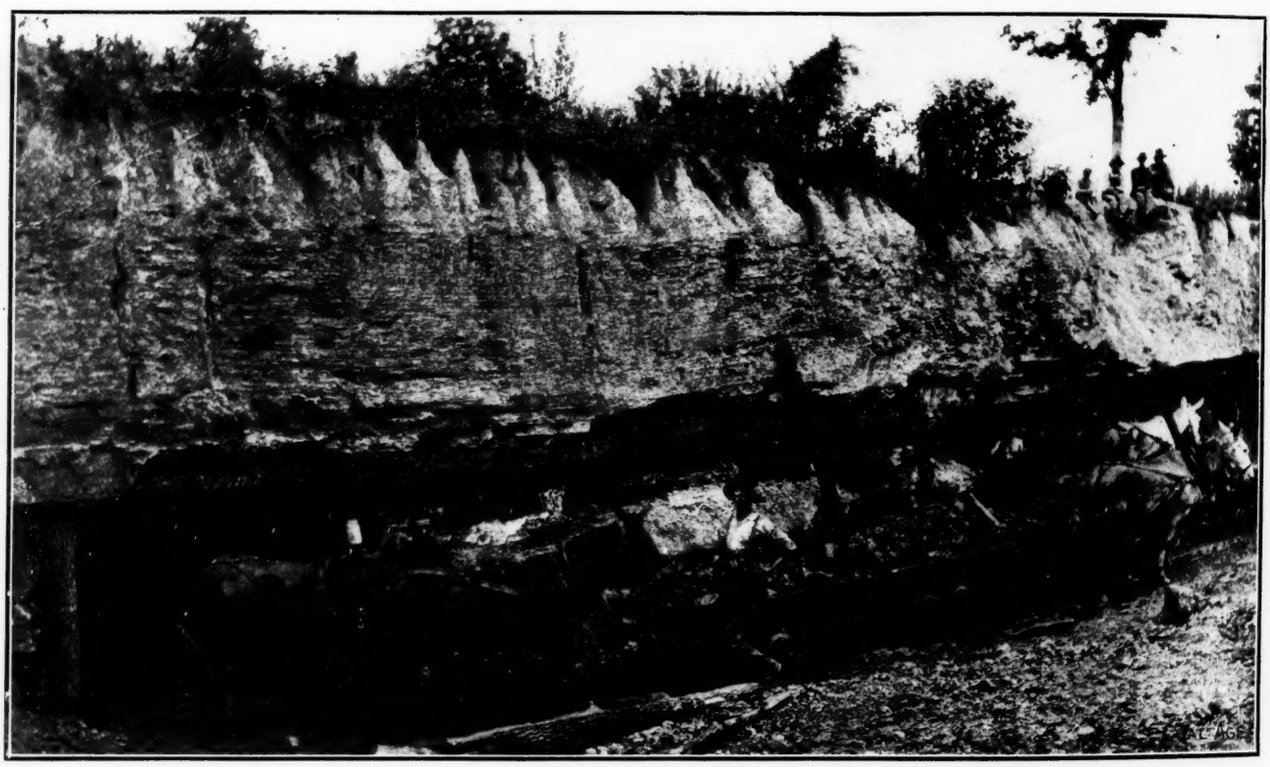
This field is located in the southern part of Sebastian County, Arkansas, near Huntington, on the Mansfield branch of the St. Louis & San Francisco R.R. and 28 miles southeast of Fort Smith.

The measures lie in the form of a syncline the sides of which have a pitch varying from 10 per cent. on the south to 6 per cent. on the north. The axis of this syncline pitches 5 per cent. in a southwesterly direction under the Sugar Loaf Mountains, under which the coal is in all probability 2000 to 3000 ft. in depth. The field on its extreme end is about 600 ft. wide and the sides gradually flare out until it has a width of five miles at the point where the mountains are approached.



VIEW OF A COMBINATION MINING AND STRIPPING OPERATION, COMMONLY CALLED "PIGEON HOLES"

The coal is mined by means of shafts, slopes, drifts and stripping operations. At the present time there are 10 mines in the field, operated by four different companies, namely: The Central Coal & Coke Co., Bache-Denman, Coranado Coal Co. and the American Smokeless Fuel Co. The first concern has four mines in operation, known as Nos. 2, 3, 5 and 6, all being shaft openings with the exception of No. 5 which is a drift mine. These are all working the same seam, known geologically as the Hartshorne Coal and to the trade as Arkansas Semi-anthracite.

CENTRAL COAL & COKE CO'S. MINE

This mine is the largest producer in the field and also holds the record for the state of 2300 tons in one day. It is located about two miles west of Huntington, on the Frisco R.R. The shaft is sunk directly on the axis of the syncline. This location has proven to be of great advantage in the matter of handling the water, as well as having all grades, for the most part, in favor of the loaded cars and at the same time no adverse grades for the empties. The shaft is 8 ft. 6 in. by 18 ft. 6 in. and 123 ft. deep.

The tipple is a three-track frame structure, equipped with self-dumping cages, shaker screens, a 5-ton weigh hopper, and an Ottumwa box-car loader; there is also a 66-ft., 100-ton, Strait railroad track scale. The box-car loader is capable of loading 40 cars per day.

The screens are set at an angle of 1:4 and are capable of handling 225 tons per hour. The screen arrangements are such that five grades of coal can be made. All slack is shipped to Doubleday, Ark., where the company is operating a 1000-ton washery. The tipple machinery is operated by a 10x14-in. Litchfield engine. The hoist is a 16x30-in. Litchfield, first motion engine, equipped with 6-ft. wood-lagged drums. The underground haulage engine is a 14x20-in., double-drum Litchfield, geared 3½ to 1.

The boiler room is equipped with five, 18-ft., 150-hp. boilers, two of which were furnished by John Redpath, two by John Rohan and one by Brownell. Pumps are used instead of injectors. In the machine shop the power is furnished by a 6x8-in. Wright-Adams, vertical engine. This and the blacksmith shop are well equipped with all the tools and machines necessary for the upkeep and repairs needed about the mines. A well-equipped carpentry shop is also maintained. The water supply for the boilers is obtained from Cherokee Creek near the shaft. Slack coal is used exclusively in firing the boilers. All the surface buildings and cage room are lighted by electricity obtained from a plant located in Huntington, Ark., and owned by the Coal & Gas Belt Electric Company.

INSIDE EQUIPMENT

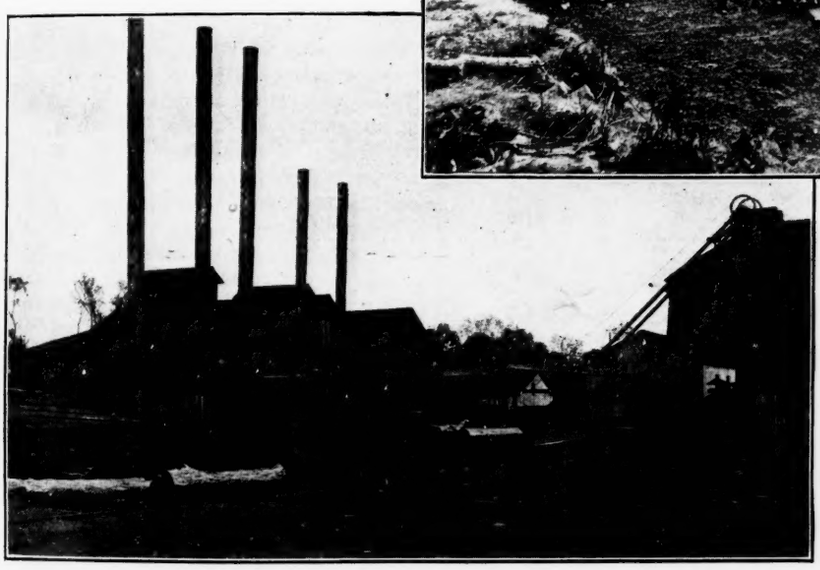
The mine cars have a capacity of two tons, a gage of 36 in. and are of wood construction. The pump located at the bottom of the shaft is a Canton-Hughes

16x8x12 in. with an 8-in. suction and a 6-in. discharge. In one of the dip entries are located three Worthington 10x 6x10-in. pumps having a 5-in. suction and a 4-in. discharge. They pump through drill holes 140 ft. deep.

The ropes used for haulage purposes are of the Yellow Strand brand 7/8-in. in diameter for the head rope and 3/4 in. on the tail rope. The mine is equipped with telephones, throughout all the working places, which are always in direct communication with the shaft bottom and the engineer on the surface.

Methods of Mining

The mine is worked by the usual room-and-pillar system. Entries are driven 14 ft. wide and rooms have a width of 24 to 28 ft. Entries are driven on sights and all mining is done by hand and by shooting off the solid. Drilling is done with the usual breast augers and the shots are fired by regular shot firers employed for that purpose. Very little gas is encountered and no serious accidents have occurred from that source.



Central Coal & Coke Co.'s Mine No. 3, Near Huntington, Ark.

The capacity of this mine is at present 1600 tons per day, which could be easily increased to 2000 tons by the installation of a more efficient haulage system. The tail-rope haulage system is used at present, in the south and west workings; while in the east and northern portion, mule haulage is used exclusively.

The coal worked in this mine is described by the U. S. Geological Survey as the Hartshorne seam. It has a thickness of vein matter of 8 ft. 6 in., cross-section from roof to floor being as follows: Roof, sandstone; coal 4 ft.; soft shale 1 ft.; coal 6 in.; hard shale 4 in.; coal 2 ft. 9 in. and the floor is of shale.

Mining is usually carried on by what is known as the three-bench method as this has proved to produce a much cleaner product than any other. The top 4 ft. of coal, called the top bench, is mined, shot and loaded out, leaving the 1-ft. shale band clean. This shale is quite soft and is shovelled into the gob. The 6-in. coal is then wedged loose and this produces a fine grade of lump coal which the miner uses to an advantage in building up his car, thus gaining an additional capacity. After removing the 6-in. coal, the bottom bench is loosened with a couple of light shots and as the slate overlying this is of a hard nature, it breaks into pieces which can be easily discerned and culled from the coal when it is being loaded.

Some of the miners work on the two-bench method, but this increases their labor since they have to carefully inspect the coal as they load it and the resulting product is not so clean. Occasionally the seam contains a streak of bone coal of from 2 to 6 in. in thickness, however the coal as a whole is remarkably free from such impurities. In some portions of the mine, rolls are encountered which cut down into the top coal but do not effect the bottom. All rooms and entries are worked "double" that is, two men in each place.

Considerable trouble is encountered in this mine due to water which enters from the surface through cracks in the strata caused by squeezes, and because of the close approach of the entries to abandoned mines on the north and east which are now inundated. In the early days in this field a great many stripping operations were worked and as a result the

Beginning of a Stripping Operation

crop line entirely around the syncline has been excavated. In times of heavy rains these strip pits act as catch basins for great quantities of flood waters which overflow into the mines. This water eventually finds its way into mine No. 3, for while the entries have not been driven into any abandoned workings, the water readily percolates through the large slate band. These stripping operations have been a source of great expense to the mines which are located in the interior of the field.

Ventilation and Wage Scale

The mine is ventilated by a Crawford-McCrimmon 15-ft. fan. All entries are laid with 25-lb. steel and rooms with 16-lb. Mules are used to gather to the main partings where the tail ropes handle the coal in trips of from 12 to 18 cars. The roof conditions in the south and west portion of the mine are such that little timber is used, while in the eastern and northern part the roof is of slate and conditions are such as require a great amount. Black powder is used exclusively in shooting the coal and it is delivered to the miner at his working place in 25-lb. cans. While the character of the coal is such that a great amount of dust is made, it is not considered dangerout because the working places are always quite wet.

Analysis and the Wage Scale

The coal is a semi-anthracite of excellent steaming qualities. It is used for both steam and domestic purposes and is shipped as far south as the Gulf of Mexico and north to Kansas City, Mo.

The following analysis is taken from the Government reports:

Fixed carbon	72.87
Volatile matter	17.27
Ash	5.18
Moisture	1.99
Sulphur	2.69

The coal burns with a short, sootless flame and makes little smoke. It can be stored for months with little depreciation and does not fire spontaneously. It is quite soft and does not stand shipping long distances very well.

All coal is paid for on a mine-run basis which is in compliance with a state law. Miners are paid 68c. per ton and are required to keep their places in proper condition, lay all the track except the switch and put up all timber. They are paid 32c. for each set of cross bars, put in under order from the mine foreman, and 25c. per yard in places which are wet. Draw slate is paid for at the rate of 2½c. per inch for all over 2 in. in thickness over an area of 15 sq.ft.

At some of the mines, rock-men are employed whose duties are to clean up all draw slate or rock, for which they are paid $2.84 per day. Drivers are paid $2.84 per day when driving a single mule and 10c. extra for each additional mule. Timbermen, roperiders and cagers are paid $2.84 per day, trappers $1.25 and greasers $1.85.

Entries are driven for $2.47 per yard regardless of the width. All outside labor with the exception of carpenters, mechanics and engineers are paid $2.25 per day. Engineers are paid $87.75 per month and mechanics $3.05 per day.

Conditions Favoring Dust Explosions

By John Verner*

Mr. Verner believes the amount of dust and explosive used are not the sole index of the violence of an explosion. The draft of air which feeds the flame is not without influence. Apparently a draft toward the explosion exists even when the expulsive violence is at its height. But the draft prior to the explosion is important and this is more in evidence near the floor during the winter, which season consequently is considered to favor the combustion of the dust.

*Chariton, Iowa.

Last March, George S. Rice, chief mining engineer, Bureau of Mines, made the following statement regarding the contemplated work at the Bruceton experimental mine: "The principal object at the present time is to determine how and why coal dust explodes, in order that means of prevention and limitation may be suggested from the experiments and be tried out subsequently."

This means that after many years of effort the precise functions of the elementary factors entering into the creation and propagation of a coal-dust explosion are still unknown or, at least, but imperfectly understood. Under the circumstances the suggestion of remedies of prevention must remain more or less tentative until there is a complete and correct understanding of the fundamental principles involved.

Dust Not the All-important Factor

It has been said that in an explosion the presence of dust is the all-important factor. In my judgment, that is placing its value entirely too high. The presence of the dust has about the same importance with relation to an explosion as the presence of the fuel in front of the boiler has with reference to the fire beneath it. Mere presence produces no effect in either case.

The more important thing in an explosion is the means by which the dust is brought into contact with the flame and by which its instantaneous and voluminous ignition and rapid combustion are accomplished. The size of the pile of fuel in front of the boiler does not determine the rate of combustion on the grate, neither does the amount of dust present determine its rate of ignition or the violence of the explosion.

The Amount of Dust and Explosive Not a Measure of the Force

In preparing for the experimental explosion of Bruceton of Oct. 31, 1911, one pound of coal dust was used per linear foot of main entry, and in the test of Feb. 24, 1912, two pounds of dust were distributed per linear foot. The first explosion with the less dust charge was by far the more spectacular and violent. A greater powder charge was used in the first explosion, and the result might be attributed to that fact, but such conclusion should not be hastily accepted.

In one of the Altoft's experiments, 400 lb. of coal dust were used with a powder charge of 2½ lb., and in another experiment 183 lb. of dust were distributed and the powder charge was only 1½ lb. The experiments with less dust and powder charge produced the more violent explosions.

The Action of the Air is Also a Determinant

In the Bruceton tests the dust used was of the same kind, fineness and dryness, and the tests were made, except as stated, under conditions exactly alike. The same can be said with regard to the Altofts' experiments. In view of this, and as neither the size of the dust charge in the Bruceton tests nor the size of the dust or powder charge in the Altofts' experiments accounted for the degree of violence exhibited, it appears that the air, as the only remaining principal factor not considered, may have exerted in some manner the determining influence in this respect.

Force without Motion

In examining mines after explosions, I frequently found cars and other material broken and twisted and the broken mass left almost in the same place, as the cars, etc., occupied prior to the explosion. Evidently such effect could not have been produced by a force moving in one direction only and appeared to be due to the action of two forces moving in opposite directions at the same time.

Assuming this to be true, then one of the forces and apparently the greater, was the outrushing explosion and the other the inrushing air, but it seemed impossible that a powerful counter air movement could be created and maintained against the tremendous force of the explosion. Many things, however, which seemed impossible have turned out to be worthy of credence.

The Counter-air Current

About 10 years ago I discovered, in a rather peculiar manner, the fact that under certain conditions a strong counter-air current could exist in the face of an apparently superior repelling force. I was examining a small mine and found the ventilation unsatisfactory.

In looking for the cause, I found that the air course was small and that the air compartment in the shaft had an area of only 6 sq.ft. The fan, connected with the compartment by a single intake, was exhausting, its diameter was 12 ft. and its blades were 3½ ft. wide, and it was making about 100 revolutions per minute.

The casing was tight fitting on the sides with little expansion along the fan's periphery and the air was discharged from the fan opening in a horizontal direction. Stepping in front of this opening and close to the blade tips, I was surprised to find that a strong air current was entering the fan at its

periphery on the side opposite the intake opening.

Air Drawn into the Periphery of the Fan

The width of the inflow was about 9 in., it was continuous and of such force that it required a strong grip on the handkerchief I held in front of the revolving blades to prevent it from being drawn into the fan. After discovering the fact, the cause of the air inrush was readily accounted for.

On account of the cramped airways and the small compartment in the shaft, the air could not enter the intake opening of the fan in a large enough volume to fully and continuously replenish its area of depression. Therefore the remainder of the air needed for that purpose had to be supplied some other way.

It was, therefore, drawn through the periphery of the fan against the repelling force of the blades, which had a tip speed of more than 60 ft. per sec. and, furthermore, an increase in this repellant force by speeding up the fan also increased the velocity of the counter current. Some years later I found another fan working under similar conditions and producing similar results.

Perhaps the Air in an Explosion Does Not Travel All in One Sense

Admittedly an area of depression exists in every dust explosion, and after observing the air movements at the fan, it occurred to me that if the small depression in the fan under certain conditions could produce a strong counter current against the repellant action of the blades, the much greater depression in a dust explosion under similar conditions could produce similar, though more powerful effects.

It also occurred to me that if the existence of such counter current in a dust explosion could be proved, its presence and action would not only reasonably account for the presence of forces apparently moving in opposite directions at the same time, but it would also furnish the means for carrying to the flame in the most effective manner the dust and air supply necessary for its propagation.

The Advancing and Receding Current at a Mine Fire

It would probably have another important function. In watching the behavior of a mine fire of some magnitude burning in an entry, two things can be noted by the observer: First, the draft before reaching the fire is deflected toward the bottom with an increase in its velocity and force until it enters the fire at its base; second, a tongue of flame extends forward and for some distance overlaps the swiftly moving draft.

This particular flame action in conjunction with draft is not peculiar to a mine fire alone (the above example being merely used as an appropriate illustration), for it may be observed at any fire burning in an inclosed space, where the draft enters the flame horizontally at the base of the latter and its effects and danger are known and feared by every experienced city fireman who enters a building with its contents ablaze.

The Direction of the Draft Determines the Sense of an Explosion

The cause which determines the direction of a dust explosion is not definitely known. Some say it is the presence of the dust. With the existence of a counter-current established and the effect of such draft or flame movement known, it would appear that this draft, rather than the dust, is the "pioneer" which largely directs the course of the explosion.

It seemed decidedly worth while to investigate this matter, and as the firing of a shot represents an explosion on a small scale and is often the starting point of more extensive ones, I concluded to make a series of tests in the immediate neighborhood of shots fired in the coal, in order to find out what effects were produced, especially with regard to air action.

Shot Firing and the Motion of Air

The shots were fired in the face of an entry and in the absence of artificial draft. In all tests simultaneously with the firing of the shot a mometary expulsion of air from the face of the entry was noted, which was followed instantly by a reactionary air movement along the bottom toward the face, while in the upper part of the entry the smoke and hot gases kept on their outward course.

In some tests the air inflow along the bottom was decidedly strong, in others it showed less force, the results evidently depending on the degree of heat produced by the shot, or, in other words, on the amount of depression created at the face. The results of the tests with regard to air movement were in marked agreement with the conditions found at the fan, and fairly indicated the probable behavior of the elementary forces at work at the start of an explosion.

Deficiency in Moisture Not the Only Cause of Winter Explosions

It is a well known fact that the occurrence of dust explosions is almost entirely confined to the colder months of the year. This is said to be due to the more general dryness of the mines in the winter time, and that is probably a factor of considerable magnitude.

But as there was some rather strong evidence that the difference in moisture was not the only reason, and perhaps not even the main one, to account for the marked presence or absence of explosions at different seasons of the year, and as the presence of strong draft appeared to be a most potent factor in an explosion, I concluded that the state and manner of air flow in a mine might be of more or less assistance in producing this draft, and I therefore determined to investigate this feature.

For that purpose I established an observation point on an entry in a certain mine, ¼ mile inby from the downcast. The entry was 5x8 ft. in the clear, and strings were stretched across 6 in. apart, so that air measurements from top to bottom could be readily taken in every test at precisely the same place.

Air Travel over Cross-section Rendered Unequal by Temperature

The air measurements were taken at all seasons of the year, and a record kept of each test, giving all the details, including the temperature at the observation point and outside. For the purpose of this article it is only necessary to present a partial record of two of these test measurements. One test was made in midwinter, the other in midsummer.

Test 1.	Outside temperature..... 9 deg.
	Inside temperature.....40 deg.
	Volume of air passing per minute, 12,800 cu.ft.
	Velocity of air at the top.....200 ft. per min.
	Velocity of air 6 in. from top..230 ft. per min.
	Velocity of air 1 ft. from top..300 ft. per min.
	Velocity of air at center.....400 ft. per min.
	Velocity of air 1 ft. from bottom.....400 ft. per min.
	Velocity of air 6 in. from bottom.....400 ft. per min.
	Velocity of air at bottom.....300 ft. per min.
Test 2.	Outside temperature.....88 deg.
	Inside temperature.....58 deg.
	Volume of air passing per min. 5,120 cu.ft.
	Velocity of air at the top.... 80 ft. per min.
	Velocity of air 6 in. from top..165 ft. per min.
	Velocity of air 1 ft. from top..178 ft. per min.
	Velocity of air at center.....170 ft. per min.
	Velocity of air 1 ft. from bottom.....120 ft. per min.
	Velocity of air 6 in. from bottom..... 95 ft. per min.
	Velocity of air at bottom.... 73 ft. per min.

As the fan was kept at about the same speed during the time the observations were taken, and as the air channels of the mine remained of the same length, it may be assumed that the volume of air in test 2 was due entirely to the work of the fan and was forced into the mine under adverse conditions.

It may also be surmised that the larger air volume found in test 1 was due partly to the fan's work and partly to the effects of favorable natural conditions, but evidently in neither case had the fan's action anything to do with the distribution of air flow at the observation point.

In Winter the Draft Is Strongest Near the Mine Floor

The manner of air flow was determined apparently by the difference in temperature prevailing inside and outside of the mine. In test 1 the greatest air velocity was found to be at and below the horizontal center line of the entry and near the bottom, and in the test 2 the greatest velocity showed above the center line and near the top.

The velocity near the bottom in test 1 was four times the velocity found in

the same place in test 2, and it is obvious that such naturally produced and naturally accelerated air flow must quicken the start and velocity of the air movement along the bottom toward the heat and flame area of a blown-out shot.

The Floor Draft Causes the Dust Explosion

Dust explosions generally originate at the face, where during working hours much fresh, dry dust is produced. Therefore, dust conditions at the face remain practically the same the year round. As the rate of combustion, other conditions being the same, depends upon the amount of draft available, the reason why dust explosions generally occur in the colder months appears to be that the presence of a strong natural draft toward the face in the winter favors the occurrence of these explosions and that the absence of such draft in the summer acts as a preventive.

The velocity and volume of draft passing through a mine with a fixed draft-producing force depends on the size, length, number and condition of the air channels of the mine. Then, as the presence of draft appears to be necessary to start a dust explosion and as the heat and flame of a blown-out shot are rather limited in power and extent, it follows that the draft facilities of a mine must be exceptionally good, in order that the heat and flame of such shot may attract a sufficiently strong draft to carry the dust and air to the flame and make possible the start and extension of the explosion.

Violent Dust Explosions Only Found in Small or Well Ventilated Mines

The record shows that the occurrence of violent and extensive dust explosions has been entirely confined to experimental galleries a few hundred feet in length, to new mines and to older mines with many and roomy air channels and more than the usual number of openings to the surface. In recent years so many of the most disastrous explosions have occurred in the best class of mines, with superior draft facilities, well planned with due regard to the conservation of the coal resources and the health and life of the miner, that the "model mine" is now looked upon by some men with suspicion and its safety has become a matter of doubt.

The Care Needed in New Mines

There should be no backward step, the method of working and ventilating the mines should be the best that can be devised under existing conditions, but it is a fact, and I hope it will soon be generally recognized, that a blown-out shot or the ignition of a small body of firedamp is infinitely more dangerous in a new, uptodate mine, with special attention given to the removal and moistening of the dust, than in an old, neglected mine, carelessly managed, with dry dust present in large quantities, but having poor draft facilities.

I know of several cases where dust explosions occurred in certain nongaseous mines while they were new, but as the workings moved further from the shafts explosions ceased to occur, although the method of mining remained the same, blown-out shots were as frequent as ever and dust accumulations increased.

The Workings on Withdrawing Pillars Approach the Shaft and Become Dangerous

These mines remained free from explosions for years, but when, in bringing back the pillars and taking out the blocks of coal left in, the workings again reached the vicinity of the shafts and blown-out shots occurred in the neighborhood where the first explosions had started, they again made their appearance. With such evidence available, the correctness of the claim that the mere presence of the dust is the paramount factor in an explosion may rightly be questioned.

A New Self-Oiling Mine Car Wheel

Special Correspondence

Ever since the development of the steel mine car there has existed a demand for a wheel as durable as the car itself.

The Self-oiling Car Wheel

The Orenstein-Arthur Koppel Co., of Pittsburgh, Penn., has recently designed and placed upon the market a cast-steel wheel which, after the most rigid of experiments, promises a life as long as that of the car. Cast steel is particularly well adapted for this purpose, as it is tough and durable and a special mixture in this case, makes it unusually hard and strong.

The greatest wear on the self-oiling wheel is on the bearing or where the axle passes through the hub of the wheel hence ordinary chilled iron wheels must be scrapped as soon as the bearing is worn to a slightly larger size.

Method of Securing Maximum Wear

To secure the maximum of wear in the new wheel, a cast-iron bushing is carefully machined to fit perfectly and inserted in the hub. Hence the bushing, only, must be renewed, which operation may be accomplished by any blacksmith in a few minutes' time and at a cost of but a few cents. The hub of the wheel is cored out to form a large oil cellar and holes are drilled in the bushing to permit the oil to reach the axle.

For the purpose of oiling, a hole passes from the outside of the hub into the oil cellars. This oil hole is closed by a pin operated with a spring. The pin is made with a thumb latch at one end and when slightly turned brings the hole of the pin in line with the oil hole, thereby allowing the oil to pass freely through. As soon as the pin is released it starts back, closing the oil hole, preventing leakage and keeping out the dirt.

Another great advantage with these cast-steel wheels is the fact that they may be made many times stronger than the chilled iron wheels with considerably less weight.

This latter feature naturally means a reduction in the dead weight to be hauled; hence, a saving. This, in itself, would cover the cost of installing the wheels.

Although the cast-steel wheel is an innovation in the coal-mining industry of this country, it has been used abroad for many years and is regarded as a standard equipment in such service.

Artificial Coal Experiments in Germany

Foreign Correspondence

At the annual meeting of the Association of German Chemists, Dr. Bergius, of Hanover, read a paper on his experiments on the manufacture of artificial coal. He heated cellulose, or peat, with water, to a temperature of 340 deg. C., at a pressure of over 100 atmospheres, in a specially constructed apparatus. Both these substances were transformed into a product physically and chemically identical to coal.

At a temperature of 310 deg. C., the process took 60 hours, and at 340 deg. C., the transformation took place in eight hours. The speed of the reaction is doubled with every additional 10 deg. C. of temperature.

Dr. Bergius estimates on this basis that the time necessary for the formation of natural coal, at the temperature of the earth's crust, is 8,000,000 years, a figure approximating that given by geology.

Working Conditions for Wire Ropes

By Daniel Adamson

An analysis of the conditions affecting the durability of wire ropes, including weight and height of lift, the size of wires used, ratio of pulley diameter to size of rope, number of bends, and general arrangement of ropes and pulleys.

Note—Abstract of a paper read before the Institution of Mechanical Engineers.

The question of the durability of the parts of mechanical structures seems to be strangely neglected by all authorities. A designer has generally the choice of several formulas for calculating the mere strength of a given member, but usually he has to depend upon his own experience for the correctness of the proportions that will insure a reasonable life. The durability of wire ropes in particular is of great importance to all engineers, whether engaged in the design and manufacture of lifting appliances, or in their care and management.

The two most important conditions appertaining to the manufacture and use of steel wire ropes that affect their durability are:

(*a*) Quality of material and size of wire.

(*b*) Diameter of pulleys and arrangement of ropes.

Quality of Material and Size of Wire

The wire used for lifting ropes is of crucible steel having a tensile strength varying from 80 to 130 tons per square inch. Although ropes made from material having a high tensile strength are of smaller diameter, for a given load and a given factor of safety, yet this is not a great advantage because the stiffer character of the wires makes larger drums desirable, if the durability of the rope is to be considered, notwithstanding that some rope makers claim as an advantage for the stronger material that it does enable smaller sheaves to be used, with a consequent lower cost.

The ratio of the diameter of the individual wires to the diameter of the completed rope is an important factor. If the wires are too large they are stressed considerably when passing over the pulleys, and accordingly the material is quickly fatigued and the wires break. Smaller wires, on the other hand, are more quickly worn through by rubbing against the pulleys and against their neighbors in the body of the rope.

The stress in a wire due to bending round a pulley is directly proportional to the modulus of elasticity and to the diameter of the wire, and inversely proportional to the radius of the pulley; therefore the radius of the pulley should be increased with an increase in the modulus of elasticity, if the same number of bends is to be endured by a stronger wire of the same diameter. Unfortunately a theoretical calculation of the stresses induced in the wires of a rope by being bent over a pulley does not alone afford a reliable guide to the length of life to be expected from the rope, for consideration must also be given to the mutual wear that takes place among the wires.

Assuming for the purpose of comparison that two ropes are constructed of equal size, one from wires half the diameter of those in the other, then for equal strength the one rope will have four times the number of wires and each of the wires will have one-quarter the cross-sectional area. According to the usual formula, the stress due to bending will be half as severe in the smaller as in the larger wires, when the ropes are bent over pulleys of the same diameter.

If it be allowed that a reasonable figure for the estimated stress due to bending an ordinary rope over a pulley of a size usually adopted in crane design be, say 30 tons per square inch, and the stress due to the suspended load be 10 tons per square inch, there will be a range of stress of 40 tons per square inch in the material each time the maximum load is lifted and released. The corresponding stresses in the rope of finer wires will be 15 tons per square inch, due to bending, and as before 10 tons per square inch, due to the suspended load, or a total range of 25 tons per square inch.

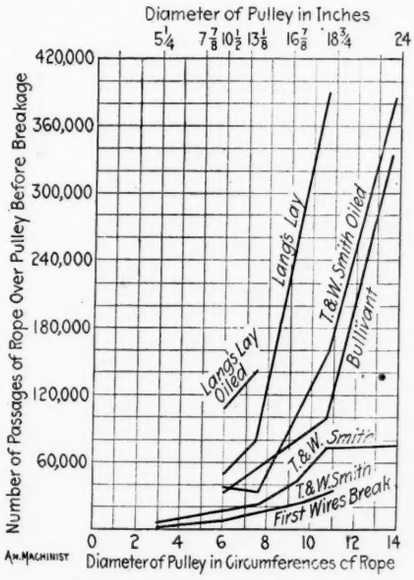


FIG. 1. EXPERIMENTS ON DURABILITY OF WIRE ROPES

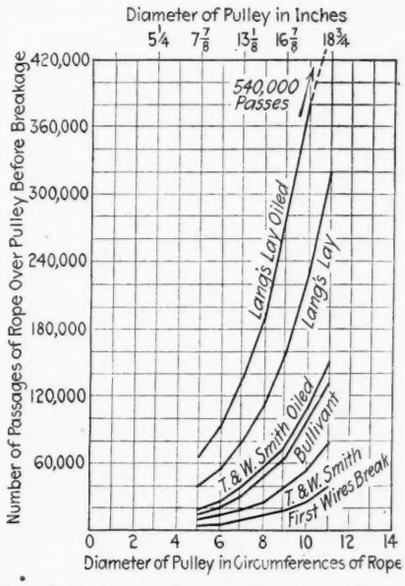


FIG. 2. REGULAR CURVES BASED ON DATA IN FIG. 1

Points Effecting the Durability

Judging by the discussion that took place on Messrs. Eden, Rose and Cunningham's paper before this institution in November last on "The Endurance of Metals," there is, as yet, no agreement as to the exact effect upon the endurance of variations in the working stresses. It seems, however, to be reasonable to assume that a reduction in range of stress from 40 tons per square inch to 25 tons per square inch would increase the life of material, such as ropes are composed of, about 500 times. As no such improvement in the life of a rope has ever been experienced, or is to be reasonably expected, it must be taken for granted that abrasion is the principal factor in limiting the life of wire ropes, and therefore the effect of abrasion upon the suggested rope of finer wires may now be considered.

When the rope of finer wires is passing over the pulley, there being four times as many wires in it, the pressure, at each point of contact between the rope and the pulley and between the individual wires of the rope may be assumed to be one-quarter of what it is in the rope of larger wires. The wires being of half the diameter, the damage done to them by contact, even under this lower pressure, will be at least half as much as occurs to the coarser wires in the other rope, and this half damage done to a wire of one-quarter the sectional area will result in the cutting through of the wire in half the time, so that the effect of abrasion upon the rope of finer wires will be twice as great.

If a smaller pulley be used for the rope of finer wires, as suggested by some

authorities, the pressure at the points of contact and the stress due to bending will be proportionately increased, so that it may reasonably be expected that with a pulley-diameter bearing the same proportion to the diameter of the wires the life of the rope with fine wires will be one-quarter of that of the rope of coarser wires working over a pulley of correspondingly increased diameter.

A German investigator, Ernest Heckel, refers to the great surface pressures on the wires at the place of contact with the pulley (amounting in his opinion to as much as 12 tons per square inch). as a vital point in connection with the wear of wire ropes. This high pressure, accompanied as must be the case by relative movement even if quite small, readily accounts for the wear which takes place on the surface of the wires where they touch the pulleys or the other wires in the rope.

Diameter of Pulleys and Arrangement of Ropes

The lists issued by makers of wire ropes contain recommendations as to minimum sizes to be adopted, but no information is given as to the effect of using pulleys of different diameters. I have felt for many years past the want of such information and, the experience of users afforded no reliable guidance, presumably on account of the great difference in the conditions under which ropes work in different shops.

Reference to a paper read before the Manchester Association of Engineers by Mr. Matthews in 1902 brings to light one great difference in the working of cranes. Mr. Matthews, in his paper, suggested that 400 to 1700 lifts per crane per annum was the amount of duty required from certain cranes under his control, while the present author, in the discussion on Mr. Matthews' paper, mentioned 32,400 to 43,200 lifts per crane per annum as representing his own experience in another class of work.

Other important features that will affect the life of a crane rope are the average weight lifted and the average height of lift; cranes are generally occupied with loads much below their nominal capacity, but this will vary in different workshops as will the proportion between the maximum height of lift available and the height most frequently attained by the hook.

Inquiries addressed to the users of cranes elicited many different replies; ropes working upon cranes of the same general design were found to last for periods of from two years to ten years and upward, and one correspondent suggested that 20 years might be expected from ropes on cranes (of from 5 to 20 tons capacity) if damage from accidental causes could be eliminated. As might be expected, the ropes on foundry cranes have not so long a life as in erecting shops, the relative difference being perhaps as three is to five.

The most reliable and consistent information that the author has been able to discover (with the assistance of numerous friends and correspondents, and also of the library staffs of the Institution of Mechanical Engineers in London and of the Engineering Library in New York, to all of whom his sincere thanks are due) is contained in a paper by A. S. Biggart,* published in 1890.

*Proc. Inst. C. E., vol. ci, page 231.

The experiments to which this paper refers were undertaken with the object of selecting the best form of rope to be employed in the construction of the Forth Bridge. A full description of the apparatus used and the details of the investigation will be found in the original paper, and I will content myself with a short reference to the experiments and an abstract from the conclusions arrived at, adding some deductions I have made for my own guidance and for the purpose of this paper.

The apparatus used by Mr. Biggart

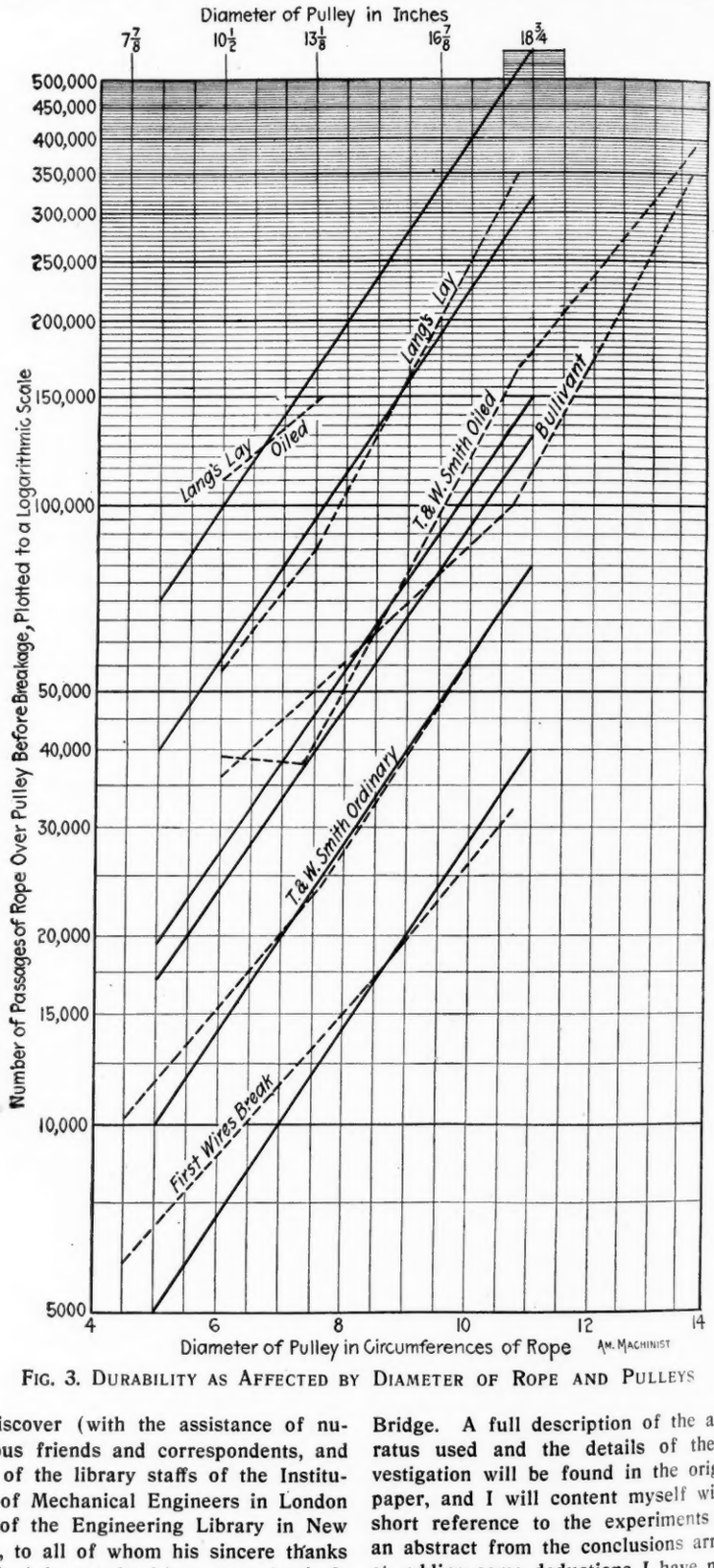
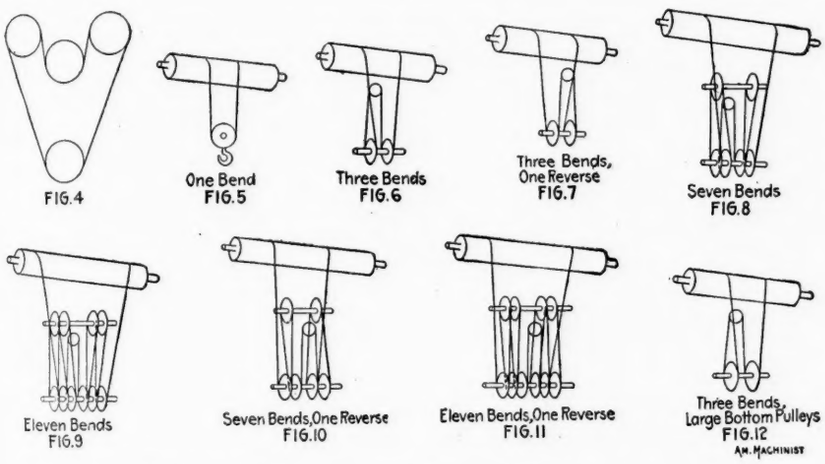


Fig. 3. Durability as Affected by Diameter of Rope and Pulleys

contained two pulleys, round which the rope under trial was passed, the lower pulley being weighted to give the required tension on the rope. The experiments consisted in passing the ropes, under a normal working load, to and fro over the pulleys until breakage ensued. Experiments were repeated with different diameters of pulleys and different makes of rope, and the accompanying diagram, Fig. 1, shows the life of different classes of rope as affected by the diameter of the pulleys.

Relative Life Under Different Conditions

The effect of oiling the ropes is shown by the diagram to be very beneficial, increasing the life of a given rope by two or three times. This is obviously due to the reduction of the cutting action of the wires upon each other. Experiments were also made to ascertain the effect on the life of a rope when running it over pulleys so arranged that the rope was subjected to reverse stresses, as shown in Fig. 4. The results obtained from this series of experiments showed that generally the life of a rope working under such conditions was only one-half as long as a similar rope bent in one direction only.



Various Arrangements of Lifting Appliances

Fig. 1 is based upon the actual figures tabulated in Mr. Biggart's paper, while Fig. 2 shows my approximations, as obtained by the simple method of drawing fair and regular curves through or near the points representing the results of Mr. Biggart's experiments over such a range of pulley diameters (measured in terms of the circumference of the ropes) as obtain in general overhead crane practice. Several interesting deductions may be drawn from a study of these figures. The time of breakage of the first wires of a rope in the lowest curve is only recorded for one make of rope, but comparing it with the second curve, which shows the time of breakage of whole ropes of the same make, it will be seen that when the first wire breaks the rope may be assumed to have passed through one-half of its life. As no one knowingly works a rope until it breaks entirely, the breakage of even a few wires is a sign that a rope should be carefully watched and replaced by a new one at an early opportunity.

The effect of varying the proportions of diameter of pulley to diameter of rope is one of the most important features to be noticed. Speaking generally, Mr. Biggart's experiments show that increasing the diameter of the pulleys by an amount equal to two circumferences of the rope will double the life of the rope. This is approximately correct for all the varieties of rope and conditions experimented with, and may therefore be taken as equally correct for all the varying conditions under which cranes are worked.

It is remarkable that so simple a rule should evolve from such numerous and varied experiments, and I hope that its statement in this form will be of some value to designers and other interested members. That it is sufficiently correct for all practical purposes may be readily seen by referring to Fig. 3, where the ratios of pulley diameters to ropes are plotted as abscissas to a linear-scale while the durability of the ropes is represented by ordinates drawn to a logarithmic scale.

Results of Tests

These conclusions enable one to express a definite value for the effect upon the durability of ropes, of the various arrangements of pulleys that are commonly adopted in overhead cranes, some of which are illustrated in Figs. 5 to 11. Assuming that Fig. 6, in which the ropes make three bends in working, namely, one at the upper drum and one on each side of the lower pulley, i.e., at entering and leaving, is the arrangement most frequently adopted in practice, and representing the anticipated life of the rope under these conditions by 100, then the relative lives of the ropes in each of the other arrangements indicated will be shown in Table 1.

TABLE 1. COMPARISON OF ANTICIPATED LENGTH OF LIFE OF ROPES ARRANGED AS SHOWN IN FIGS. 5 TO 11

Fig. No.	Number of Bends	Relative Life of Rope
5	1	300
6	3	100
7	3*	75
8	7	43
9	11	27
10	7*	37½
11	11*	25

*Including one reverse bend which is twice as effective in wearing out the rope.

If it be desired to design each of the above arrangements of pulleys so that the ropes shall have equal durability, then the ratio of the drum diameters to rope circumference (if the law indicated by Figs. 2 and 3 is to be relied upon) must be increased, as shown in Table 2.

It is quite usual for purchasers to specify in their inquiries that the diameters of the pulleys and drums must bear a certain relation to the diameter of the rope, but I wish to emphasize the point that this stipulation is not sufficient in itself without some consideration being also given to the arrangement of the rope and pulleys.

TABLE 2. REQUIRED INCREASE IN DIAMETERS OF ROPE DRUMS (MEASURED IN TERMS OF CIRCUMFERENCE OF ROPE) REQUIRED TO GIVE EQUAL DURABILITY

Fig. No.	Increase over Diameter called for by Fig. 6
7	1 Circumference of Rope
8	2½ Circumferences of Rope
9	4 " "
10	3 " "
11	4 " "

If the generally accepted ratio of seven circumferences, or twenty-two diameters, of the rope for the diameter of the barrel be assumed as suitable for the drum and pulleys arranged as in Fig. 6, then the diameters for the other figures, to give equal durability, should be as shown in Table 3.

TABLE 3. RATIO OF DIAMETER OF PULLEYS AND DRUMS TO CIRCUMFERENCE OF ROPE TO GIVE EQUAL DURABILITY

Fig. No.	Ratio of Pulley and Drum Diameter to Rope Circumference
5	4 to 1
6	7 to 1
7	8 to 1
8	9.5 to 1
9	11 to 1
10	10 to 1
11	11 to 1

To make the comparisons quite fair between the different arrangements it must now be pointed out that owing to the increased number of falls of rope adopted

in Figs. 8 and 9 the size of the rope may be reduced as shown in Table 4, while retaining the same factor of safety.

TABLE 4. RELATIVE ROPE CIRCUMFERENCE ALLOWING FOR SMALLER ROPES DUE TO INCREASED NUMBER OF FALLS

Fig. No.	Number of Falls	Relative Rope Circumference
5	2	140
6	4	100
7	4	100
8	8	70
9	12	57
10	8	70
11	12	57

Combining the figures given in Tables 3 and 4 we have drum and pulley diameters as shown in Table 5.

TABLE 5. DRUM AND PULLEY DIAMETERS RESULTING FROM A COMBINATION OF TABLES 3 AND 4, AND STILL ASSUMING THAT 100 REPRESENTS THE CONDITION IN FIG. 6.

Fig. No.	Ratio of Pulley and Drum Diameter to Rope Circumference according to Table 3	Relative Circumference of Rope as per Table 4	Resultant Pulley and Drum Diameter assuming Fig. 6 = 100
5	4	140	80
6	7	100	100
7	8	100	114
8	9½	70	95
9	11	57	90
10	10	70	100
11	11	57	90

The noticeable feature in the last table is that whether two, four, or six falls are adopted, the diameter of the drum and pulleys should remain about the same, if the ropes are to have equal durability (compare Figs. 8 and 9 with Fig. 6). A recent textbook upon the subject of crane design states (as an advantage of a large number of falls of rope) that the proportionately larger pulleys and barrel will insure long life for the ropes, but I hope I have made it clear that unusually large proportions are necessary to insure a reasonable life for ropes on cranes with many falls of rope. Reference to Fig. 7 and Fig. 10 in Table 5 shows the increase that should be made in the diameter of the drum and pulleys if a reverse bend occurs in the run of the rope.

The result of increasing the diameter of the pulleys, as shown in Fig. 12, by an amount equal to two circumferences of the rope, will be that the effect of the double bend round the lower pulley is halved, and the resultant effect of the three bends will be equal to two only and the relative life of the rope will be increased by 50 per cent., or the drum diameter might be reduced by an amount equal to 1.2 times the circumference of the rope with a corresponding reduction in the size of the framework of the crab or winch, while still retaining a relative life for the rope equal to Fig. 6. In this case the diameter of the lower pulleys would only require to be about one circumference of the rope larger than the original size of Fig. 6.

Conclusions Reached

In making the foregoing comparisons of diameters of drum and pulleys with different arrangements of rope, it has been assumed that the hook is raised to the full height available at each lift. This, however, is not the case in actual practice, the majority of loads not being raised one-half this height.

Where there are more than two falls of rope, as in Figs. 8 and 9, the effect of increasing the diameter of the pulleys by an amount equal to two circumferences of the rope is also very marked, reducing the effect of the seven bends in Fig. 8 to four and a half, with corresponding increase in the lift of the ropes. This shows up the fault of those designers who adopt large drums (in order to obtain the great length of rope entailed by high lifts) and are yet content to make the pulleys of small sizes, when they could enormously increase the durability of the rope by the adoption of larger pulleys at little extra cost.

When the rope makes a reverse bend at the barrel as in Figs. 7, 10 and 11, the barrel ought to be increased in diameter to counteract the effect of the reverse bend. Thus, if in each of these cases the diameter of the drums were made larger by an amount equal to two circumferences of the rope, the durability of the rope would be equal to Figs. 6, 8 and 10 respectively.

Some Continental makers point out, very rightly, the desirability of making the compensating pulleys of reasonable size. The motion over such pulleys is apparently considered as negligible by some designers, judging by the forms of construction adopted, but this point of view overlooks the movement of the rope due to the swinging of the load, and the repeated bending of the rope at the same place over a small radius has an appreciable effect upon its durability.

Although the deductions laid down here appear too simple to need elaboration, a glance at the designs of many modern cranes shows that neither the designers, nor the purchasers, are aware of the importance of the principles involved; otherwise we should not see modern cranes in this country with reverse bends in the ropes, and as many as eight plies of rope to carry the load on cranes of only 15 tons capacity, while at the recent Brussels Exhibition there were cranes exhibited by well known Continental makers showing the same faults.

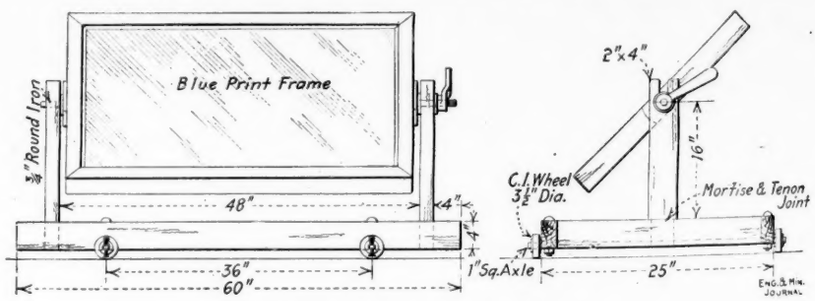
The qualities of wire used vary considerably, and this, together with the heat treatment in manufacture and the care taken by the makers in testing and examination, are questions that makers of ropes are in a better position to discuss than users.

The Lay of the Strands and Lubrication of Rope Influence Durability

The "lay" of the strands and the lubrication of the rope when in use have each a considerable effect upon durability, and some guidance on these points may be obtained from Fig. 3, where "Lange's lay" is shown to have more than double the life of ropes of ordinary "lay," and ropes that are oiled last more than twice as long as when this precaution is neglected, as already mentioned. The superiority shown by "Lange's lay" naturally gives rise to the question as to why it is not exclusively used, and the answer I have obtained from rope makers is that such ropes must be very carefully handled to avoid "kinks," and also they are found to be more liable to "spin."

Truck for Blueprint Frame

The *Engineering and Mining Journal* has published the following description of an ordinary blueprint frame showing method of constructing:



Simple Truck for Blueprint Frame

The accompanying illustration shows a simple type of truck for supporting a frame when making blueprints. The truck is easily constructed and answers all the purposes of a more expensive device. The clamping device permits the placing of the frame at the best angle for printing. This truck can be made at any mine shop from materials that will ordinarily be found at hand.

Three tons of average coal will make two tons of coke; one ton of coal will smelt two tons of iron ore and produce one ton of finished steel.

Natural Mine Rescue and First Aid Conference

In our last issue we gave an account of this conference at some length. It will be well to add here the reports of the committees.

Committee on Rescue Apparatus and Training

We recommend that such breathing apparatus as may be used for mine-rescue and mine-recovery work shall be of such types as have passed the tests of the Bureau of Mines.

We indorse the course in rescue training as outlined by the Bureau of Mines schedule for educational purposes and for familiarizing miners in the use of the breathing apparatus, and further indorse the recommendations of the bureau to the extent that for actual mine-rescue work, supplemental and practical training of two hours each should be taken at intervals of not more than three months.

We recommend that all mine-rescue stations should be equipped with at least five breathing apparatus and the necessary accessories for its continuous operation during 24 hours. At remote stations supplies adequate for 48 hours of operation should be kept on hand. Such equipment should be so located as to admit of its assembly in one hour at a central point for emergency use.

We recommend the keeping of birds and mice at rescue stations for the purpose of detecting carbon monoxide.

We recommend that all persons, before being admitted for rescue training, present a medical certificate declaring them qualified for rescue work and free from contagious diseases.

We recommend to the Bureau of Mines that it prepare lists of stations, together with the names and addresses of the persons who have completed training in the use of mine-rescue apparatus, and that the names be listed on a mine-rescue roll of honor and submitted to the local press for publication in the various mining localities, and that volunteers should be compensated for services and considered when promotions are being made.

The Committee recommends that the smoke room is best adapted for the first course of training. In addition to the above the men should be trained in the manner prescribed by the Bureau of Mines. Supplementary underground practice is desirable.

Committee on Rescue Operations

The committee resolved that in rescue work, untrained men should not be permitted to use breathing apparatus except when it is the only chance to save a life. In selecting untrained men it should be remembered that discipline and training are of equal importance.

A subcommittee made the following resolution:

Outside Organization

1. All openings should be carefully guarded.
2. There should be a man in charge of outside arrangements to see that ventilating appliances are kept in condition and ready for use when they are required.
3. Reliable and competent men should be placed at all openings to the mine and they should obey the orders given them.
4. A competent person should be placed near the entrance to the mine to examine all safety lamps and no lamps should be taken into the mine unless they have been so inspected and approved.
5. Some specified person should be placed at the entrance of the mine to check off all persons entering and make a record of the same when they go into and come out of the mine.
6. Proper provision of food and shelter should be made for the parties engaged in rescue work.
7. A physician should be on hand while rescue parties are in the mine.
8. Safety lines should be established around all openings inside of which lines no open lights should be allowed.
9. A man should be placed in charge of the rescue squads to organize and have them ready to enter the mine when called upon.

Inside Organization

1. A man should have full charge of the inside operations on each shift.
2. An advance squad under a competent leader should explore the workings in advance of the other squads who are advancing the ventilation, making repairs, and carrying out bodies.

The squads should advance in the following order: (a) Breathing-apparatus or advance squad. (b) Stretcher squads. (c) Temporary-ventilation squad. (d) Material squad. (e) More-permanent-ventilation squad.

3. A station should be established, which would form a base of operations from which to work, and a competent person should be placed in charge, who would re-examine all lights before allowing them to be carried beyond him to the interior of the mine.
4. A telephone should be established at this station to communicate with the surface, and to be carried into the workings as fast as possible.
5. No person should go in advance of the ventilating current except the advance squad, which shall make an examination of the atmosphere for gas, and examine the return air current fre-

Doctors, First-aid Men and Their Hosts at the National Mine Rescue and First-aid Conference

quently for indications of fire; also for any other dangers which are likely to exist.

6. A doctor should be located at this inside station with necessary supplies for his use.

7. While advancing into the mine all unexplored openings should be marked as dangerous.

8. Strict discipline should be maintained at all times.

A second sub-committee made the following resolutions:

We recommend that owing to the varied conditions in different mines and the hazardous work undertaken, the question of the maximum distance rescue crews should proceed beyond fresh air should be left to the decision of the official in immediate charge, who should decide the matter in conjunction with the mine officials.

We recommend the necessary rest for rescue men and a limit of the hours of work: That the rescue men should not work longer than two hours, except when a longer time is absolutely necessary. Each shift should be followed by not less than six hours of rest.

Committee on Safety and Electric Lamps

This committee recommended that: No open lights be used; that in coal mines only such types of safety lamps and electric lamps as have passed the tests of the United States Bureau of Mines should be used; that electric lamps unaccompanied by safety lamps should not be used unless the party is equipped with breathing apparatus; that both safety lamps and electric lamps always be used up to the point where breathing apparatus is put on and that beyond such point only one safety lamp shall be used which should be carried by the leader of the party, and this should be extinguished if explosive gas is present in dangerous quantities.

Committee on First-Aid Methods

We recommend that the Sylvester method of artificial respiration be the one adopted unless an injury makes its use inadvisable.

We recommend that in cases of the dislocation of a hip or a shoulder, the dislocation should not be reduced, but that the limb should be fixed in the line of deformity.

We recommend that a man with a broken back should be handled with as little movement as possible. If found in any other than a recumbent position, he should be so kept. If found stretched at full length posterior splints should be applied extending from head to foot, or he should be laid upon rolled blankets.

We recommend that in the treatment of all fractures of long bones, splints long enough to hold the joint above and below the fracture, should be used, for example: If there is a fracture of the leg, splints should be applied which will extend below the ankle and above the knee. Long splints are to be recommended in the fractures of the lower limbs. The forearm and arm splints as designated in Dr. Shields' textbook on first-aid, page 71 are recommended.

We recommend that it should not be the duty of a first-aid man to reduce any dislocation except that of the lower jaw or the fingers and that the triangle be used in preference to the roller bandage.

We recommend that no first-aid man should be allowed to wash a wound and resolve that the application of any foreign substance to a wound, other than a sterile substance, should be condemned.

We recommend that in the absence of sterile or antiseptic dressing in case of a severe hemorrhage, the same be controlled by a tourniquet and that no dressing be applied to the wound.

We recommend that an injured person should be carried on a stretcher with his feet first unless there be some contrary indication.

We recommend that when a man is receiving an electric shock the current should be either cut off or short-circuited before he is rescued, if that be possible. If not the rescuer should insulate himself, and remove the patient from the conductor, or remove the conductor from the patient. We recommend that the article in Miner's Circular No. 5, in regard to the treatment of electric shock be followed.

We recommend that an injured man when moved should be handled by the first-aid corps on the same side as his injury; in other words, the injured side should be next to the men lifting the patient. We recommend that in all cases an injured man should have the right-of-way from the place where he received the injury to the surface.

We resolve, that a committee of seven persons consisting of: Two first-aid men, two operators, two physicians, and one representative of the Bureau of Mines be appointed to act as an advisory board or executive board. This committee will have the power to accept or reject any new dressings which may be offered in any field contest.

Committee on First-Aid Training

A motion was made and passed indorsing the Red Cross system of first-aid training. The doctors' other recommendations were marked by a desire to secure harmony rather than to advance the discussion of preferable action in cases of accident.

Committee on First-aid Contests

We favor contests as opposed to exhibitions for the larger companies having a great many mines, and believe that intra-company contests are to be preferred, while for the smaller companies operating only one or two mines, inter-company contests are desirable.

We recommend that the method of judging should be by a system of discounts, the following demerits to prevail at all contests:

	Demerits	Per cent.
1	Not doing most important thing first	2
2	Captain's failure to command men properly	2
3	Slowness in work	2
4	Failure to entirely cover the wound	2
5	Wrong artificial respiration	2
6	Loose splint	2
7	Not padding splints properly	2
8	Loose bandage	2
9	Bandage too tight	2
10	Granny knot	2
11	Awkward handling of patient on stretcher	2
12	Lack of neatness	2
13	Assistance lent by patient	3
14	Tourniquet too tight	3
15	Failure to stop bleeding	5
16	Not treating shock	5
17	Failure to be aseptic	10

We recommend that one judge should not handle more than three teams, and less teams to a judge would be preferable. These judges should be rotated. They should be first-aid men and surgeons, and each contest should consist of not more than five events.

We recommend that in all contests, speed should not be an essential element, but that a certain time should be allotted to each event. Failure to finish in the allotted time should be discounted 1 per cent. for each minute over time.

Committee on Hospitals and Safety Stations

A joint committee was formed between the committee on hospitals and safety stations, which resolved that:

We believe that underground surgical hospitals are unnecessary, but that there should be deposited at different points in the mine a sufficient number of first-aid packages properly equipped with first-aid emergency dressing; that in addition there should be located central first-aid dressing stations at the bottom and immediate surface opening of the mine.

Commitee on Organization

We resolve that this conference be made a permanent organization; that the presiding chairman of this conference, H. M. Wilson, be elected the president of a temporary committee to be composed of seven members, that there be elected a vice-president, that C. S. Stevenson be elected secretary, and that the other members of the committee be appointed by the president; that the purpose of the temporary committee shall be to draw up a constitution and by-laws, and otherwise complete the organization; and that until there be such permanent organization, all details in connection with first-aid and other matters be passed over. The motion was adopted.

Many of the resolutions passed by the committee on first-aid training are omitted as they do not concern matters on which any difference of opinion exists.

Current Coal Literature

The Best Thought Culled from Contemporary Technical Journals, Domestic and Foreign

"The Menace of American Coal"

Under the above warning caption, our foreign contemporary, *The Iron & Coal Trades Review* (London, England), makes the following editorial comments on the rapid growth of American coal exports:

If any proof were required that the former immunity of British coal from competition has definitely gone, the most recent trade returns from the United States supply it. To the inroads of German coal upon our foreign markets must be added those of the Western Hemisphere.

In this country we have been more or less satisfied because the Board of Trade records a steady advance. Indeed, the coal trade has been looked upon for years past as our staple industry largely because of its bulk and the employment to shipping which it has given. The fact that where we show a gain of millions of tons in our output, the United States shows tens of millions has been allowed to pass without much general comment. Indeed, we are apt to be indifferent to some extent perhaps to what is happening elsewhere, while Germany, successful and eager for yet further success, follows with studious attention the development of American trade, but nothing appears to disturb the deep-rooted conviction among us of our ability to hold our own, whatever the course of events.

We should test ourselves by an international, not by a narrower standard and compare our progress with that made by other nations. It has been generally accepted that in respect to coal we have little to fear from America. If its coal output has increased, so has its home consumption. Cardiff and Newcastle are known throughout the world as coal-shipping ports, while in the United States of America no ports are particularly identified with the industry. Yet, while Great Britain exports to foreign countries 65,000,000 tons, American ships handle close on to 50,000,000 tons coastwise, although the prevailing idea among us is that the United States has no ocean-going vessels outside of the "Morgan Combine," and some lines of small relative importance.

Steamers which go to the Tyne or Bristol Channel ports have to concede some days for loading time if they carry 7000 tons or over. In the States a 3000-ton boat will load and bunker in 10 hr., and 15,000-ton steamers swing out into the tideway in 15 hr. ready for sea. On July 31 last, 26,851 tons were loaded over the piers in 24 hr. at the Lambert Point piers of the Norfolk & Western Railway.

It is entirely a misconception to suppose that our export coal trade is a matter of indifference to the Americans. Collieries in the United States do not work 250 days in the year. Some only work one day a week, and the man who gets 200 days' full pay in the year is fortunate. It follows that colliery owners are anxious to find fresh markets in order to reduce the cost of production.

Advance industrially and in population as the United States may, the consumption of coal is necessarily limited. Railway extension there, has been restricted of late years from the fear of some adverse decision of the Supreme Court based on the Sherman legislation. It is the hope of a sensible settlement and of the consequent building of new railways and the laying down of a fresh line of metals alongside the old, on the existing lines that has given birth to the general opinion that, after the Presidential election, there will be a boom in trade that will beat all previous records.

Again, oil exists in America, and wood is in many districts an alternative and economical fuel, while electricity is an important source of energy. Under such circumstances as these, it is natural for the coalmasters of the Eastern coalfields, where the best coal is found, to cast their eyes across the Atlantic.

American Foreign Agencies

The agencies which have been established abroad may be experimental, but they represent the convictions of the directorates of the various companies that an outlet for American coal exists on this side, and a determination to avail themselves of it. Already American coal has established something of a footing throughout the Mediterranean. Marseilles, Genoa, Naples, Trieste and Alexandria import it regularly. America can be relied upon to deliver.

It is a fact that in the States the labor leaders are made responsible for the results of their actions, and not infrequently expiate their excesses in prison. License such as is tolerated in this country is not permitted, and terrorism is not rampant as it is here.

American trade unions also are managed more consistently with the political institutions of the country. After his term of office the president of the union retires. Here, except in the case of ill-health, a leader holds his position mostly for life, often with a seat in Parliament. As the authors of "The Miners' Next Move" complain, he "becomes a gentleman"; and assumes the airs of an autocrat, claiming blind obedience.

Apr. 1 saw the commencement of the American coal strike. The export of anthracite fell from 375,000 tons in April, 1911, to 80,000 in April, 1912, but bituminous coal rose from 870,000 tons in April, 1911, to 1,225,000 tons in April, 1912. The exports of anthracite are officially computed to be 18,000 tons for May, 1912, as against 381,000 tons for May, 1911. Bituminous coal exports are officially computed at 1,486,000 in May, 1912, as against 1,221,000 tons in May, 1911. Bunkers shipped in May, 1911, are given as 619,000 tons, and are computed to have amounted to 692,000 tons in May, 1912.

Surely these figures are in themselves eloquent, seeing that they cover a strike period. Thus, like Germany, the United States shows a gain in exports notwithstanding the strike, and a consequent scarcity of labor, many of the colliers of foreign nationality having returned home.

It is clearly the case, therefore, that the development of the foreign trade of the United States in coal does actively concern us. Shipments have been made to Europe for some years, and the movement has gained strength with time. American coal remains a factor to be taken into consideration when the prospects of British markets receive attention. May they not be prejudiced by continued labor agitation for we have no easy task before us in recovering lost ground—or attempting to do so.

Longevity of Miners

Mark Ford, speaking at the North of England Institute of Mining and Mechanical Engineers, said: "Thirty years ago there were at Washington colliery two fore-overmen, two back-overmen and two master-shifters. One fore-overman was 70 years of age when he died, the other was 75 years old at death. One back-overman retired at 75 years of age and died when 78; the other was promoted, when a very old man, to be master-wasteman and died when 75 years of age, being at the mine every day till his death. The two master-shifters both lived till they were over 70 years of age.

A Mudding Machine for Mine Fires

Animated by successes in fighting mine fires by injection of mud, the owners at two important colliery operations in France have built mudding machines which are operated by water under pressure of 76 lb. per sq. in. By plastering the face of the coal and the mouths of the boreholes, the water is prevented from escaping from the coal face until it has deposited the material it carries.

Note—Translated for Coal Age from the French by R. Dawson Hall.

M. E. Langrogne*, engineer of the mining corps of the French government, has written an account of a machine which is used to inject mud into the crevices of coal, so as to extinguish mine fires:

An apparatus was introduced in 1910 into the basin of Decazeville, and it has rendered the operation of mudding much more easy than by the old hand methods. The simple contrivances of M. A. Aron, have in practice a number of disadvantages.† The use of the pump involves much physical labor, and preparations which occasion not a little trouble. Moreover it easily becomes clogged by the injection material.

Use of Water under Pressure

The director of the Aciéries de France thought that it would be more simple to use water under pressure. This was to be found in all the headings of l'Aveyron. It may be noted that it was after having read the article by M. Aron that M. Calvelly, director of the Aubin collieries (Aciéries de France), thought of trying mudding from above and using the water under pressure which was available throughout the mine.

All that was needed was to make the mixture without losing the pressure of the water. That is to say, it would have to be done in a closed tank and carried directly onto the fire. After a number of experiments, complete success was obtained, and the method is not now confined solely to the Aciéries de France, but is being used also by the Société Commentry-Fourchambault-Decazeville.

The principle is as follows: A hole is drilled above the fire; tubes are placed in the same and pushed into the end of the hole. These are connected with the apparatus which, when operated, forces the mixture into the measures which are on fire.

Description of Apparatus

The apparatus consists of a cylindrical body, made of steel plate, furnished at the top with an opening which closes hermetically. Through this hole are thrown the materials which are to be injected into the coal. The water comes under pressure through a lower opening, mixes itself with the material mentioned and is forced through a pipe at the other end.

The pipe by which water enters is on the same end of the cylinder as the handle and measures 30 mm. (practically 1 3/16 in.) in diameter. The other end is furnished with a small pipe placed a little above its center and serving for the effluence of the mixture, and below this is a manhole introduced to permit the cleaning of the apparatus.

The mixing is produced by stirring the contents of the steel tank. For this purpose a shaft, placed in the axis of the cylinder, carries eight paddles within the tank and a crank handle on the outside. The paddles are placed at 45 deg. to one another so as to stir up the whole mass by each movement of the handle through a quarter of a circle. Consequently the workman has only to operate it by a forward and backward movement, which does not fatigue him excessively.

Manner of Charging

The planning of a method of opening the tank presented some difficulty. The system ought to be as simple as possible in order to avoid loss of time whenever the apparatus is charged. It should also be sufficiently tight that it will not let any water escape from the apparatus when under pressure.

After having tried several systems, to which the chief objection was that they were complicated, the Aciéries de France has arrived at the following: The upper part of the apparatus is provided with an oval opening, of which the larger axis is parallel with the axis of the cylinder.

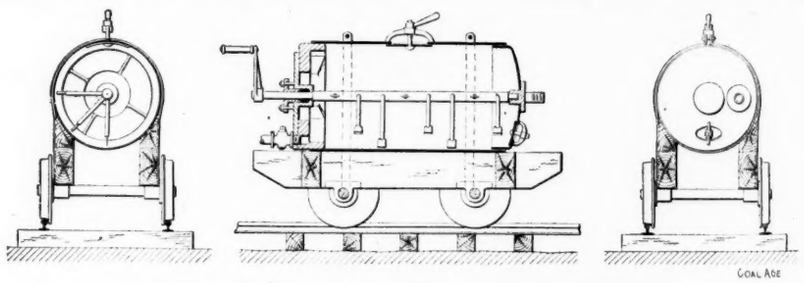
This hole is closed by means of a plate which is shaped on its upper face to fit the edges of the hole, and it is easy to remove the cover by placing it at right angles to the axis of the hole, after which it can be lifted out with ease.

The apparatus is mounted on an ordinary four-wheeled truck. This permits it to be drawn from place to place as easily as an ordinary mine car, which is usually more heavily laden. It can thus be taken into any working place in which a road has been laid down.

Drilling rods and pipe complete the outfit. The former are 30 mm. (1 3/16 in.) in diameter, are 2 m. (6 ft. 6 in.) long and are designed to receive a boring tool of 50 mm. (2 in.) diameter. The iron pipes are of 40 mm. (1 5/8 in.) diameter and 2 m. (6 ft. 6 in.) long. They can be screwed end for end to make the long tubes, which are used in the bore holes. Finally there are some hose pipes of 40 mm. (1 5/8 in.) in diameter, which serve to connect the mudding apparatus with the water line and injection tubes.

The Injected Material

The materials injected are the same as those which are used in mudding by pumps. At the Aciéries de France they, at first, employed the ashes from the flues of boilers, passed through a screen having square openings measuring 2 mm. (1/12 in.) each way. On account of the excellence of the results obtained, they put in service several of these mudding machines, and the ashes were not sufficient for their purpose. So they had to have recourse to ordinary ashes, which had been selected with care.



A Mudding Machine for Extinguishing Mine Fires

At Decazeville they have used only the flue ashes of boilers and the dust from Cowper stoves of blast furnaces. The screened ashes are placed in sacks, each holding 50 liters (1¾ cu.ft.) and are hauled to the work in coal cars.

Location of Boreholes

The drilling of the boreholes which should precede the mudding of the coal demands careful consideration. Their placing, inclination and length ought all to be chosen judiciously and with regard to the conditions. It is necessary in the beginning to determine the position of the fire, the importance of which decides the number of holes.

*Annales des Mines Tome XX Livraison 7. July, 1911.

†See Coal Age, "How the French Fight Mine Fires, Sept. 14.

A local heating above a heading or in the top of a working place only demands about one borehole; on the other hand, an important fire would require a series of drillings, the number of which would be in proportion to the progress of mudding. In principle, the end of the borehole ought to be sufficiently above the fire that the cone in which the material descends from the point of discharge may include the whole of the burning material.

It may be said that the cone will have an angle at its summit of 60 deg. and that the length of the borehole ought not to exceed 6 m. (19 ft. 6 in.), because we do not wish to complicate the operations any more than necessary.

The Slope of the Holes

The inclination of the hole depends upon the pressure of the water. At the Aciéries de France, where the head of water equals 53 m. (or 174 ft.), the holes are drilled almost vertical.

At Decazeville, with a line pressure of the same value, the management prefers to place the holes at 45 deg. in order that there may be no difficulty in performing the work. This inclination seems to me to be best and ought to be exceeded only in exceptional cases, or when it is necessary to reach a considerable height without an excessively long hole.

The notes which we have given will enable the reader to combat localized fires. When we attack those which are more important, particularly such as involve an entire section which we desire to penetrate, it is not possible for us to hope to mud them completely. We have to be content to mud a part and remove it. The neighboring parts, by means of boreholes arranged like a lady's fan, can be treated in turn by the use of mud in shallow holes.

Cone of Mudding

We might further remark that the "cone of mudding" continually increases as the measures silt full and that the indications furnished by temperature and by the purity of the water escaping from mudded measures should serve as a guide to determine the placing of the boreholes, which later succeed those which are being used. We ought to cease mudding any given hole when the neighboring measures discharge cold water or when they refuse to take up any more material.

The drill hole being sunk, it is tubed by means of iron pipes 40 mm. (1⅝ in.) in diameter. The annular space between the tubes and the sides of the hole are carefully stopped with clay. We then connect the pipe in the drill hole with the discharge pipe of the mudding apparatus by means of a hose.

Water is allowed to flow under pressure through the feed pipe of the apparatus, from which the plate of the upper manhole has been removed. We fill the tank till half full and upset a sack of ashes containing about 50 liters (1¾ cu.ft.) into the apparatus through the upper opening. Then we complete the filling of the tank with water. When full the flow of water is stopped and we screw the cover on tight.

Then we agitate the mixture by a swift action of the stirring shaft. We permit the water to enter the cylinder under pressure and at the end of five minutes all the ashes have passed into the borehole. Then the agitation is stopped and we pass clear water for a few seconds and this cleans out the pipes. The valves are closed, the cover removed and the operation is then repeated.

A control valve enables us to note the state of the liquid passing into the coal and to see that all the ashes have passed into the borehole.

Precautions to Observe

M. Aron pointed out that watering was inconvenient because it caused bursts of steam and scorching gas and even dangerous explosions. The risks are the same in mudding.

On putting the apparatus mentioned in operation, a dull sound is heard. The water leaves the measures boiling and emitting a large quantity of steam. It may produce inflammable gas if the fire is very hot. The temperature increases rapidly in the heading. It is then advisable that the mudding be removed some distance from the drill hole, 5 or 6 meters (15 or 18 ft.) in order to provide endurable conditions for the laborer who stirs up the mixture and to lead up a current of air which will sweep away the steam as rapidly as it is formed.

It is desirable as much as possible not to allow these vapors to pass through other working places. At the Aciéries de France, in particular, work at the faces between the return airway and the point where mudding was being practiced was shut down as soon as mudding commenced.

Plastering Mud over the Face

In order to prevent the water from leaving the measures immediately and to compel it to spread itself over a large area, in order moreover to avoid any contact between the air and the fire, it is a good practice to plaster the face around the boreholes with clay so as to dam the water and exclude the air.

This method of working is above all suited to the roof of a heading where a local fire has to be extinguished. The clay facing (*coffrage*) is supported by rails placed on the collars of timber sets.

More Advantageous Than Manual Labor

The superiority of mudding by machine shows itself by a saving in manual labor. With a pump, practically four men are needed, two at the pump, one stirring the mixture and one who overlooks the timbering, face plastering, etc. In the mechanical application of mud, two men suffice, one at the apparatus and the other in charge of various other accessory duties.

We use at each operation 50 liters (1¾ cu.ft.) of ashes. In one hour we can fill into the coal 0.16 cu.m. (5.65 cu.ft.), and during an eight hours' shift, 1.28 cu.m. (45.2 cu.ft.). These estimates are the mean of a number of operations. They can be written thus: 3.2 complete operations of the apparatus can be made every hour. Each will take 19 min., the time being thus divided: Accessory operations, 14 min.; passing ashes into the coal, 5 min. In reality, the opening of the manhole, closing it and placing the pipes only consume 8 min. of time, but the mean results cover losses resulting from the inevitable delays in an operation of this kind.*

Each operation of the apparatus uses 400 liters (106 gal.) of water, or about eight times as much water as ashes. At Decazeville in each operation 700 liters (185 gal.) are used to transfer 65 liters (2.3 cu.ft.) of ashes. The volume of the water used is 11 times that of the solid material. The apparatus contains 264 liters (69.74 gal., or 9.3 cu.ft.).

A mudding machine cost the Société des Aciéries de France $43.65.

The introduction of this apparatus into the mines of Decazeville is too recent for a judgment to be rendered as to the value of the results.†

It has been, however, employed with success for filling the pillar bounding an abandoned section.

But at the Aciéries de France the results are completely proved. The trial was made at the mine l'Etage-Vert, where a pillar of coal was recovered containing about 200,000 tons. It had been abandoned and lay between old works actually on fire, which were situated above and below the pillar which was recovered.

Patriarch of Coal Forest

James Lomax, at the Newcastle meeting of the North of England Institute, said that a certain lycopod must have attained a height of about 150 ft. and must have lived throughout the whole period during which the coal in a certain bed was being formed and been in full vigor at the end. This seemed a long lifetime under adverse circumstances, if the seam consisted wholly of vegetable matter.

*At Decazeville about three cars of ashes are passed every shift of eight hours. This figure is quite similar to that obtained at the Aciéries de France.

†Since this note was written most excellent results have been obtained at Decazeville in the upper levels of the Combes Mine taken under similar circumstances to those at l'Etage-Vert.

Rocky Mountain Coal Institute

The committee appointed to issue a call and effect the organization of a "Western Coal Mining Institute" is made up of the following men, all of whom are prominent in the coal affairs of the West:

E. H. Weitzel, Mgr., Colorado Fuel & Iron Co., Denver, Colo., chairman.
Frank Manley, V. P. and Gen. Mgr., The Union Pacific Coal Co., Omaha, Neb.
W. J. Murray, V.P. and Gen. Mgr., The Victor-American Fuel Co., Pueblo, Colo.
H. G. Williams, Gen. Mgr., Utah Fuel Co., Salt Lake City, Utah.
T. H. O'Brien, Gen. Mgr., Stag Cañon Fuel Co., Dawson, N. M.
James Dalrymple, State Coal Mine Inspector, Denver, Colo.
J. E. Pettit, State Mine Inspector, Salt Lake City, Utah.
Allan French, Gen. Supt., St. Louis, Rocky Mt. & Pacific Co., Raton, N. M.
W. B. Williams, Gen. Supt., Utah Fuel Co., Castle Gate, Utah.
Frank Cameron, Gen. Mgr., Castle Valley Coal Co., Salt Lake City, Utah.
Dave Brown, V. P. Rocky Mountain Fuel Co., Denver, Colo.
David Griffiths, Supt., Nonac Mine, Colorado Fuel & Iron Co., Cañon City, Colo.
A. C. Watts, Chief Engr., Utah Fuel Co., Salt Lake City, Utah.
C. H. Gibbs, Geologist, Utah Fuel Co., Salt Lake City, Utah.

The selection of the above committee was based as nearly as possible on public choice. All of these men who are lending their time and services to the furtherance of the movement are busy coal-mine officials, who have the good of the industry so closely at heart that they are willing to dedicate valuable hours and personal effort to the cause of general betterment.

With such individuals back of any worthy movement, failure is impossible, and it is certain that all coal men in Colorado, Utah, Wyoming and New Mexico will rally to the call of the organizers.

Institutes of this kind recognize neither class nor creed, only demanding that the members be real men filled with a desire to improve their own condition, and to advance the interests of all who gain their livelihood through the production of coal.

Watch closely for the official announcement of the committee, and in the meantime, boost for the "Rocky Mountain Coal Mining Institute."

Bulk of Coal Supply from Four States

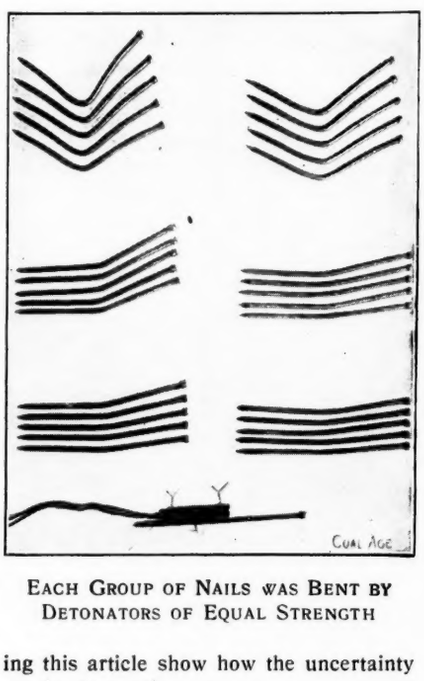
From 1814, the date of the earliest record of coal production in this country, to 1911, inclusive, according to a chart just issued by the United States Geological Survey, Pennsylvania has furnished 2,270,798,737 short tons of anthracite coal and 2,396,491,260 short tons of bituminous coal, a total of 4,667,289,997 short tons. The greatest output of anthracite coal from this state was in 1911, when 90,464,067 short tons were mined; the record production of bituminous coal was in 1910, when the yield was 150,521,526 short tons. Illinois ranks second in the production of coal during the period from 1814 to 1911, with 844,012,353 short tons of bituminous coal; West Virginia third, with 649,448,201 short tons; and Ohio fourth, with 611,949,292 short tons. None of the other states has produced as much as 500,000,000 short tons during the period. These four states have, therefore, produced during the 98-year period, 6,772,699,843 short tons of coal, or more than three-fourths of the total output of the United States.

Watch for our Birthday Number next week.

Practical Test of Strength of Detonators

EDITORIAL CORRESPONDENCE

Sometimes a miner will find that he does not get a satisfactory result with his shots and he is in doubt whether the trouble is due to the deterioration of the explosive or to a loss of strength in the detonator. The illustrations accompanying this article show how the uncertainty can be removed.

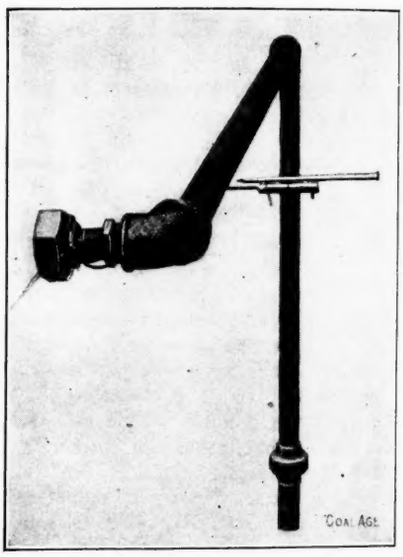


EACH GROUP OF NAILS WAS BENT BY DETONATORS OF EQUAL STRENGTH

A small finishing nail is attached by wire to a detonator and the electric leads are connected up to the latter. These same leads are stiff enough to hold the explosive cap and the nail in a level position. The stand on which the detonator is mounted will, of course, vary with convenience, but the one shown will serve the purpose well.

It has been found that detonators of equal strength produce when fired as shown equal deformation of nails of like character. The groups of nails shown were bent by the action of detonators, the members of each group being bent by exploding caps of equal strength. The miner has but to observe the bending produced by a detonator, of which the strength is sufficient and condition suited for perfect detonation of undeteriorated powder. He can then gage the condition of another detonator, the quality of which may be in question.

This scheme has been developed by Clarence Hall of the Bureau of Mines and has the good quality that it does not require special apparatus. In proving detonators, to obtain the best possible results, they should be tested with explosives artificially aged by the addition of water and their effectual action judged by the energy developed by the explosive in a Trauzl block or on a ballistic pendulum. But this method of testing would not be available for a miner, whereas the new test is found to be one on which the man in the field can safely rely.



MANNER OF TESTING THE STRENGTH OF DETONATORS

Who's Who—In Coal Mining

Attention is called to the sketch of C. L. Fay published on p. 509 in this issue. We expect to print a story dealing with the life of W. L. Connell, of Scranton, Penn., in our Birthday Number next week. Early issues of COAL AGE will contain short biographies of prominent Southern and Western coal men.

Issued Weekly by the
Hill Publishing Company
JOHN A. HILL, Pres. ROB'T MCKEAN, Sec'y.
505 Pearl Street, New York.

Monadnock Bldg., Chicago.
6 Bouverie Street, London, E. C.
Unter den Linden 31—Berlin, N. W. 7.

FLOYD W. PARSONS, Editor.

Correspondence suitable for the columns of COAL AGE solicited and paid for. Name and address of correspondents must be given—not necessarily for publication.

Subscription price $3 per year in advance for 52 numbers to any post office in the United States or possessions, and Mexico. $4 to Canada. $5 to any other foreign country.

Subscribers in Great Britain, Europe and the British Colonies in the Eastern Hemisphere may send their subscriptions to the London office. Price 21 shillings.

Notice to discontinue should be written to the New York office in every instance.

Advertising copy should reach New York office by Thursday of week prior to date of issue.

Entered as second-class matter, October 14, 1911, at the post office at New York, New York, under the act of March 3, 1879.

Cable Address, "Coage," N. Y.

CIRCULATION STATEMENT

Of this issue of Coal Age, we will print 8750 copies. No copies will be sent free regularly. There will be no back numbers. The figures shown here each week represent live, net circulation.

STATEMENT

of the ownership, management, etc., of COAL AGE, published weekly at New York, N. Y., required by the Act of August 24, 1912.

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Business Manager, William LeBaron, New York, N.Y.

Publisher, Hill Publishing Company, New York, N.Y.

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Sworn to and subscribed before me this 30th day of September, 1912.

Wm. W. Mayer,
[Seal.] Notary Public
(My commission expires Mar. 30, 1913)

COAL AGE

Committees of Safety

We have read and duly noted the many articles, notices, preambles, preludes and speeches condemning the miner for gross carelessness. Perhaps he deserves them all, but we are by no means sure. Because the genus mine worker outnumbers the official class, it is probable that against the miner must the most charges be brought in the very fitness of things. In one hundred men we are more likely to find one careless fellow than we are to find such a one among four or five.

We are not disposed to be surprised therefore that the miner is blamed and to be blamed, for most of the mortality which occurs underground. But what is surprising is that among the miners there has not arisen a persistent demand that safety precautions shall be observed, and that above all, no practices shall exist which are dangerous to others beside the careless one.

The very unions should aid in enforcing every reasonable rule and the men should refuse to work with those who purposely neglect safety precautions. Moreover, by warning one another, underground workers can save many lives without adding a burden to the daily toil or lengthening it by a single minute.

While some strikes seem utterly foolish, we recall a recent disagreement, having an element in it significant of a new spirit and a class of trouble which will line up operators who tend to violate the common rules of safety in mining to the detriment of those companies which observe them. To be sure this strike occurred at a singularly well conducted mine, but that fact only makes the remark more pertinent.

One of the points at issue was a powder house set squarely in the heart of a town. The miners wished it removed and made it part of their contention in the dispute. It did not belong to the coal company as the superintendent made plain, but the operating firm is so situated that the removal can be decreed, and we think that the powder house will soon be transferred.

It too often occurs, that instead of constructive action for regulation and safety, the energy of the mine worker has taken another trend. He has sought liberty to do his pleasure and jeopardize his life and that of his coworker. It is an old story, this resistance to restraint, but if the long series of individual accidents and spectacular disasters has not taught the miner that he must put his shoulder to the wheel and help others who are working for safety, then we can never hope to have mines as safe as those in Belgium, no matter what may be done by inspectors and operators.

Calorific Power of Coal

We desire to call attention to some facts, not new indeed, yet not generally known, and to some misstatements which have an extended circulation relative to the heat generated by various coals.

There is a misconception that a fuel consisting of pure carbon would be the great desideratum, if it would only burn, and that the fuel which contains the most carbon develops on combustion the most heat units. This idea arises naturally out of the fact that peats and lignites and sub-bituminous coals which have in them many elements beside carbon do not generate the heat which is produced by coals which contain smaller quantities of those elements.

The less carbonized fuels contain larger quantities of hydrogen, oxygen, nitrogen and sulphur than those whose metamorphism has further advanced. If the hydrogen is combined with oxygen in the fuel, forming moisture, it cannot give out any heat as it is already in its most stable form.

Some hydrogen not so combined in all probability gives out a large number of calories in burning. But probably there is a great percentage, in such combination as to form water or in such stable compounds that their dissociation involves a great loss of heat so that the burning process is barely exothermic.

We have not been fortunate enough in our researches in thermochemistries

to come across tables showing the quantities of heat required to reduce the resins and humus bodies to their component elements. The study of thermochemistry seems to have waned with the death of Julius Thomsen and a large field of needed exploration still remains for an enterprising chemist.

All we know is that the practice from Dulong onward in estimating by calculation, the thermo-equivalence of a fuel has been to subtract from the hydrogen percentage all that part, which would be needed to satisfy the oxygen in the fuel, assuming that all the oxygen was a component of water molecules. As hydrogen combines with eight times its weight of oxygen, the percentage of the oxygen present is divided by eight and the hydrogen percentage is reduced by the figure thus obtained before it is multiplied by the thermal equivalence of uncombined and burning hydrogen.

We shall at this time say nothing relative to the heat derivable from the nitrogen and sulphur compounds and pass on to consider the condition of a fuel deprived by metamorphism of its oxygen and consisting solely of hydrocarbons and free carbon with a little ash and sulphur.

It has been shown that the simple hydrocarbons give out an immense amount of heat. This occurs chiefly because of the hydrogen they contain. Were this perfectly free it would give out 61,524 B.t.u. per lb. of that gas whereas the heat given out by pure carbon is only 14,544 B.t.u. per lb.

However, the hydrogen is not free but combined. Yet this combination may not reduce the power of the oxygen to give out heat because some of the hydrocarbons require heat to create them and give out that heat on being dissociated. Thus ethylene gives out 174 B.t.u. in being resolved into its component molecules and benzine surrenders under the same condition 228 B.t.u., whereas acetylene when splitting into the free elemental condition emits 3305 B.t.u. per lb.

We do not know in what form the hydrocarbons are really found in coal, nor do we know much regarding heats required for dissociation of many of these compounds. But it is probable that many of them dissociate with a trifling absorption or with a small amount of emitted heat. Some smokeless coal consists largely of carbon plus hydrocarbons, that is, of carbon and what is, calorimetrically speaking, free hydrogen. Hydrogen gives out 4.2 times as much heat on burning as carbon and that is why many of the West Virginia coals with ash content running about 8 per cent. have a calorific output of 15,500 to 15,750 B.t.u. per lb. On the other hand, the anthracite coals almost never reach 15,000 B.t.u., as they have but little hydrogen and usually more ash than bituminous coals.

The best of cokes rarely contain 14,500 B.t.u. and even when prepared from petroleum, a coke will not exceed that calorific limit. A good fuel should be high in hydrocarbon, low in carbohydrates and in ash. We have spoken of calorific values, the experimental determinations of the laboratory, but in practice we must remember that the faculty for complete combustion is as important as the actual heat value.

Why Do They Do It?

We wish to clarify our position relative to the Bureau of Mines, which organization we have seen fit to scold and admonish at our pleasure. If we held its work, its aims, its future as a matter of no moment, if we held it as mean, trivial and unscientific, we would not weary our readers with a discussion of those few bulletins which we do not like.

We have pleasure in meeting foemen worthy of our steel and would go far afield to avoid men if we thought we might find only Don Quixote and Sancho Panza in our path. We have always thought that steelyards were for grain and potatoes, and the foot measure adapted for ells of cloth. We persist in the view that measurements with cathetometers and weighing with vacuum balances are the only correct ways in which to measure and weigh the members of a scientific bureau. It is natural for us to point out how much they deviate from an elevated standard. A farmer says a linen tape is good if it has shrunk a foot; to the engineer it is no good if it is in error, a half a tenth. Even if it is less incorrect he makes all manner of adjustments and allowances, while the geodesist is even more particular.

To quote Tennyson, the bureau is the "heir of the ages in the foremost files of time." Unrelenting, therefore, will be the criticism of those it serves if the work it does falls in any instance below the best efforts of twenty years ago.

There come to our desk at one time no less than five publications of the bureau. For four of these we can find nothing but praise. The description of the explosion at Bruceton is both interesting and clever, the article on mine fires is valuable and every reader should obtain the paper from the bureau. A limited number will read the article on the sulphur in fuels with interest and enlightenment and we have little patience with those who have said that H. H. Clark's symbols for mine maps are too complicated for practical use. They have usually been rejected for symbols far more involved and less significant.

But when our palsied hands lift that bulletin entitled "Notes on Mineral Waste," we wonder how a bureau which has done so much good work failed to escape the exaggerated vision of the conservationists. The worthy faddists persist in seeing things double like unfortunates who are afflicted with Daltonism.

How could they thus confound first and final mining? How can the spokesman of the bureau say, "In mining coal in this country probably one-third of the bituminous coal and one-half the anthracite are left in the mine"? We who would gladly drink confusion to the enemies of the bureau, falter feebly in the face of this attack on the industry so needless and unfair.

We are told that inquiries are being made as to whether this bulletin represents or misrepresents the industry. We have no great confidence that the result will be correct, though much labor is being spent on it. The miracle may well happen that some of those who do now loudly protest against the unfairness of the bureau's dictum, will ultimately declare that it is true to the facts. But this surrender will not alter our opinion that the furor the bulletin has created is justified.

The bureau is doing good work. We judge this by the general enlightenment and by the quickened sense of those members of the mining profession who were formerly not too well informed. We do not judge it by the statistics of loss of life. These fluctuate and are subject to the chances of fortune. But because of all the good the bureau is doing and has done, when we read here and there an ill-adjudged article, we cannot help exclaiming: "Why do they do it? Why do they do it?"

Discussion by Readers

Comment, Criticism and Debate upon Previous Articles, and Letters from Practical Men

Experience in the Operation of Gasoline Engines in Mines

Referring to the matter of gasoline engines in mines, I would like to draw attention to a fact that I have learned by experience. Since many small mines are being operated by the use of gasoline pumping plants and could not be made to pay if compelled to install a steam plant, the first cost of which would be prohibitive, any question relating to the successful operation of a gasoline engine in a mine is of interest.

Drawing from my own experience, I believe the real difficulty of connecting the exhaust of a gasoline engine with the discharge pipe of the pump as suggested by Mr. Holland's inquiry in COAL AGE, Sept. 21, p. 405, would lie in the obstruction that the water column would present to the free discharge of the exhaust gases from the cylinder of the engine. There must be no impediment to prevent a free exhaust, in a gasoline engine, or the gases will not leave the cylinder; and these burnt gases, in part, vitiate the air and prevent a complete explosion following. The fact is well known that a gasoline engine will not work successfully when a sufficient supply of pure air is not available in the carburetor. The air entering the cylinder may be pure, but if some of the burnt gases remain in the cylinder, the following explosion will be feeble, with the result that the engine will gradually slow down and eventually stop. This condition will always result when the discharge of a gasoline engine is muffled, as it would be if the discharge were to be connected with the water column.

I believe it would be impossible to operate a gasoline engine exhausting into a pipe line, 2000 ft. underground, even if there was no water in the pipe to create a back pressure. Assuming that the engine is of the usual type, exploding on the out stroke and exhausting on the return stroke, the flow of exhaust gases would not be continuous, and the gases in the pipe would come to rest each alternate stroke, which would further obstruct the exhaust.

A PRACTIAL ILLUSTRATION

Eleven years ago I installed a 10-hp. gasoline engine to operate a 3-in. suction pump. The installation was successful and is still in operation, having since been moved a distance further into the mine. When the engine was moved to the new location, it was necessary to make an upward bend in the exhaust line, which was three lengths of 3-in. pipe. It was not long before the engine began to operate badly; the explosions missed so often that the engine slowed down and finally stopped. All parts were overhauled without remedying the difficulty.

THE CAUSE OF THE TROUBLE

One day, after making a careful inspection, the attendant claimed he heard a gurgling that could only be caused by water accumulating in the exhaust pipe. Although this was not thought possible, the pipe was disconnected, when a half barrel of water was drained from the pipe. After that the engine continued to work better for a short time only, when the trouble repeated itself and the pipe required to be drained again. It was necessary, then, to insert a drip cock in the exhaust pipe, to enable this water to be drained off at intervals.

For a time it seemed difficult to understand where the water came from; but, as the engine only ran from 9 to 15 hr. each day, it was concluded that the cooling of the heated exhaust pipe, which was located in the return airway, caused a sufficient condensation of moisture in the pipe to produce the water that accumulated there.

My opinion is, therefore, that if a few gallons of water, in an exhaust line only 60 ft. long, could destroy the efficiency of a gasoline engine, it would be practically impossible to exhaust into a column pipe 2000 ft. long. The better plan would be to arrange the engine so as to exhaust into the return airway; or, if this cannot be done, exhaust through a drill hole to the surface.

S. U. PHILLIPS, Mine Foreman,
McCain Bros.
Hilliards, Penn.

Another Experience

I was interested in the inquiry of W. H. Holland, Jr., COAL AGE, Sept. 21, p. 405, in regard to the operation of a gasoline engine in the mine. Experience has taught me that whenever the exhaust of a gasoline engine is muffled too tightly, trouble will arise from the collection of soot in the exhaust pipe, which will eventually find its way back into the engine and make it difficult to keep the spark plug clean. We have four stationary gasoline engines operating pumps, in our mine. We have experienced much trouble in disposing of the gaseous fumes exhausted from these engines. We first ran the exhaust into the return airway, and to do this were obliged to carry the pipe about 40 ft. up a 30-deg. incline or breast. This plan gave much trouble as soot and water from the condensation of moisture collected in the pipe.

We then tried to smother the fumes by running the exhaust into a barrel half filled with limewater and covered by a screen overlaid with lime. As this plan did not give the required satisfaction, we next used mine water and exhausted into the barrel about 4 in. from the water. In order to maintain a good circulation in the barrel, so as to better absorb the gases, we tapped the discharge pipe of the pump, with a ½-in. pipe, and kept this small stream of water running into the barrel. This plan has given good satisfaction, although it has the disadvantage of requiring a small portion of the water to be pumped several times. The acid of the mine water appears to neutralize the gases.

TIMOTHY A. RYAN.
Tomhicken, Penn.

Extracting Room Pillars In Mines

The extraction of pillars is one of the most dangerous and important of all mine operations. The point to aim at is to get the coal out as quickly as possible with the minimum of danger to men and timber. The method of removal depends upon circumstances and varies with the varying conditions of each mine. A good method is to begin next to the boundary line and work out so that the weight of the strata will spread evenly over the pillars.

When the pillars are small and circumstances favorable they may be removed at one operation, though it is apt to be a dangerous proceeding unless the operation makes packing enough to stow up as in the longwall method. A safer method is to take off skips from 9 to 15 ft. wide from the sides, reducing the pillar to about 3 yd. square, then extracting the small pillars as rapidly as possible. At times large pillars are split into two or more small pillars, which are taken out in skips. Skips are sometimes taken off each side of a pillar simultaneously.

MINING ENGINEER.
Birmingham, Ala.

Sociological Department

For the Betterment of Living Conditions in Mining Communities

Philadelphia & Reading Coal & Iron Co.'s Competitive First Aid Drill

SPECIAL CORRESPONDENCE

At the first-aid competitive field drill of the Philadelphia & Reading Coal & Iron Co., at Lakeside Park, on Saturday, Sept. 21, the guests of the company expressed much surprise at the remarkable skill of the first-aid men. Therefore, it may be well to relate the methods by which Doctor Halberstadt has achieved such success.

Doctor Halberstadt finds the men very apt students. He holds lectures in the various mining towns once a week from October until April. These lectures are largely attended and the various problems of first-aid are debated with zeal. Shortly after the teams were organized, the doctor took a skeleton to one of his lectures, using it to demonstrate how limbs may be fractured.

None of the men had studied anatomy, but they showed a disposition to acquire such knowledge. In his instructions, he avoided technical terms as far as possible. Words in common usage, such as the shin bone, collar bone, shoulder blade, were used instead of Latin names. With the aid of the skeleton, the men acquired within a remarkably short period a general knowledge of the human structure.

THE ANALOGIES BETWEEN MECHANICS AND FIRST AID

It may be well to illustrate the method which Doctor Halberstadt has adopted and which has enabled him to make expert first-aid men of the mine employees, though it is, of course, not by any means entirely new. When the organ under consideration was the heart, the doctor compared it to a mine pump, and as almost all miners and mine employees understand the action of this apparatus, they were able to grasp the nature of the action of the human heart.

Upon one occasion, when a team was receiving its first instructions, the question was put to the men: "What would you do if a man had a fracture of the leg?" No one cared to answer the question. He then asked them: "What would you do if you were driving along a lonely road out of reach of assistance and the shaft of your carriage was broken?"

One man promptly replied that he would secure two strips of wood and place them on either side along the broken part and bind them tightly in place with the hitching strap. It was then explained to them that almost the same thing should be done with the human fracture.

By these simple methods the men were taught to care for the various injuries sustained by men who are employed in the coal industry. It can be readily seen that the plan was more efficacious than the use of medical books. Had the latter means been followed, there would have been danger of the men becoming entangled in a maze of technicalities, and the work would have appeared far more difficult to them, so that many of them would have been reluctant to take it up.

A "READING" AMBULANCE WITH PROVISION FOR FOUR LITTERS

THE EXCELLENCE OF THE READING FIRST-AID WORK

But the elementary method of teaching appealed to them and they realized readily that the principles were similar to those they were encountering in their daily life, and they have pursued their studies until they are today looked upon as efficient as any body of the kind in the mining world. As an evidence of the truthfulness of the above assertion, three years ago the heads of the mining bureaus of the governments of Germany, Belgium and France visited the Pottsville coal fields, and the Wadesville first-aid corps gave a demonstration of its ability for the entertainment of these guests.

The distinguished visitors were allowed to select any demonstration they desired. The problem was given and the men went promptly to work. Every man knew exactly what to do and the visitors were so pleased by the demonstration that they expressed doubt as to whether the men were really employed in the coal mines. Finally the representative of the German government asked permission to question the men as to their knowledge of mining, and, his request being granted, he plied the miners with questions dealing with every phase of mining work.

As quick as he would ask a question the answer was forthcoming, and he promptly confessed that he was really surprised at their knowledge of ordinary surgery and medicine. Upon their return to their native countries, the visitors were generous in their praise of the Reading men who had attained such a high degree of efficiency.

ORIGINAL WORK OF FIRST AID

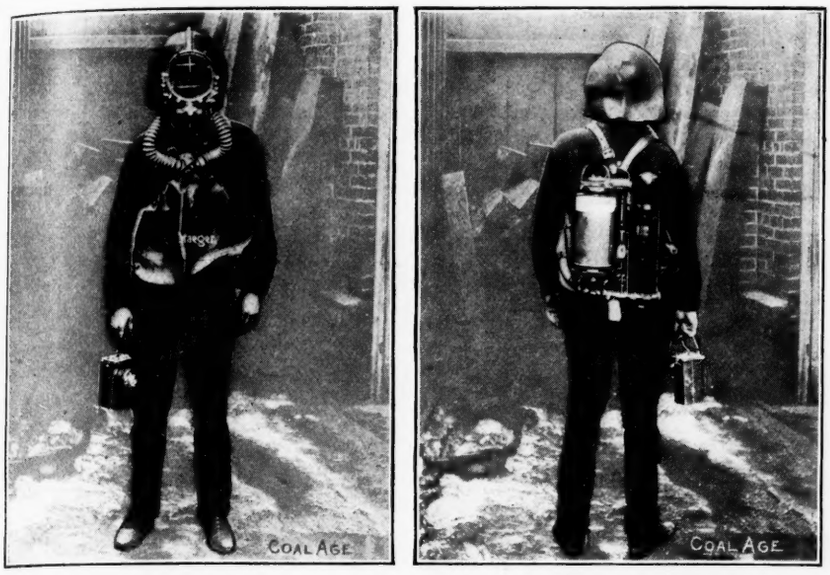
Not the least of the many benefits which have followed first-aid training is the fact that the men have, in many many instances, taken the initiative and have originated improved treatment for many injuries, as, for instance, the apparatus invented by the Wadesville team for treatment of men who have sustained injuries of the spine. Likewise the Shenandoah team has an excellent apparatus, which has been pronounced of great benefit by physicians who have seen it in use.

There has also been improvised a form for a fracture of the leg and posterior. It is formed with three splints in triangular form with a space under the knee backed up with blankets. An addition to the litter has also been perfected, making it possible to carry it up or down a declivity which is sloping at any degree.

THE MINE AMBULANCE

The photograph shows a model mine ambulance. The exterior resembles the ordinary ambulance seen anywhere with a modern carriage lamp on each side. The interior is so arranged that four litters can be placed in position at one time, thus enabling the company to transport several men at one trip if necessity should arise for so doing.

It will be readily seen from the photograph that the upper litter rests, on one side, on a heavy strap and on the other side, on a hook secured to the center post. Its removal is, therefore, easy. The



A RESCUE MAN OF PHILADELPHIA & READING COAL & IRON CO. WITH BREATHING APPARATUS

lower litter rests upon the floor. On the right-hand side will be seen a seat which will accommodate five men in a sitting position.

When necessity arises for the use of four litters, this seat can be hooked against the side of the ambulance where it forms a cushion. Each ambulance is equipped with a lantern and a modern carriage stove, so that a comfortable temperature can be maintained at all times. The improvements in this ambulance were made at the Brookside Colliery. The interest which the men have shown in this work is best proved by the fact that since the Reading first organized their teams in 1904, 10 of the members have left the mines and have taken up the study of medicine. Four of them are now practicing physicians.

A DEMONSTRATION OF WORK IN BREATHING APPARATUS

An interesting exhibition at the Lakeside meet was given in one of the buildings by trained men in charge of E. M. Chance, the company's chemist, who has direct supervision over this work. The building was first filled with smoke which was generated by burning sawdust in two ordinary stoves.

When the density of the smoke was such that it was impossible for a man without a helmet to live in the room, the rescue corps entered and at once began the work of erecting two sets of timber, cutting and framing the lumber, placing it in position as in actual mine practice. After which they covered the two sets with brattice cloth. The room was illuminated with portable Hubbell two- and four-volt electric lights. When the men had completed their task, which took them 58 min., they appeared none the worse for their experience in the smoke-laden room.

The extensive manner in which the Reading Company has taken up rescue work may be evidenced by the fact that they have 1250 men trained to use these equipments. They have one Proto or Fleuss, and 40 Draeger outfits distributed among their mines and three Pulmotors for resuscitation work.

The economic value of these equipments is evidenced by the fact that at the Shenandoah City mine fire, 16 equipments were in continual use and the men under the direction and leadership of Chance rendered valuable assistance in overcoming a stubborn underground fire which burned from Feb. 22 to April 11.

There were also on exhibition at Lakeside Park, several types of portable electric mine lamps.

For over 7 years W. J. Richards, the general manager, has been interested in a possible method of eliminating either naked flames or safety lamps in the coal mines. For a time it seemed as if T. A. Edison was outdistanced by his younger colleagues in the electrical field. But in the first week of June of the present year there was completed at the laboratory of Mr. Edison a type of battery and lamp protected with a most excellent outside case along the suggestions made by J. T. Jennings, the Reading Company's electrical engineer.

This equipment has been subjected to the usual hard usage which is encountered in mine practice and up to the present time there has not developed one flaw in either the battery or lamp; in fact if the present record is maintained, it may be safely said that we now have a portable electric mine light which will meet all conditions which may be exacted by either the federal or state authorities and the operating companies.

Coal Mining Institute of America

The institute is starting a membership campaign and desires to secure 250 members before the next annual meeting. The membership in good standing now numbers 757, and in order to make a smoothly working institute on the present financial basis, it is necessary to have at least 1000 members. The work being done and to be achieved by the institute can be done only by making the organization larger and more representative. Applications can be mailed to Charles L. Fay, secretary-treasurer, 722 Second National Bank Bldg., Wilkes-Barre, Penn.

BASEBALL TEAM OF MIDLAND COAL & COKE CO., BOYLEN, W. VA.

Lehigh Valley Coal Co.'s First Aid Contest

By Atherton Bowen*

As stated in the issue of Sept. 28, the Lehigh Valley Coal Co. held its first annual interdivision first aid contest at Hazle Park, Hazleton, Penn.

and the competition resulted in a high degree of proficiency.

Prior to the contest all present assembled in the Park Theater where John Lloyd, inspector of equipment, who had charge of the contest, explained to all, the object of the gathering and how the contesting teams were selected. He also

tion to the fact that today men are doing what the women started in the Crimean war, and urged them to continue their work and complimented them for their unselfish efforts in this humanitarian movement.

The events in the contest were published in the article of Sept. 28, to which

Westmoreland Team—Simple Fracture of Middle Third of Left Arm

Westmoreland Corps Completing Full Team Event

Drifton Corps Awaiting Arrival of Judges to Award Demerits

Blackwood Corps Covering Up Patient after Full Team Event

Primrose Team Carefully Placing Patient on Stretcher

Drifton Corps in Full Team Event—All Working

The teams were selected at contests held in each division during the latter half of August. The desire to be represented at the principal meet was keen,

congratulated the teams on being successful in their various division contests.

W. D. Owens, Supt. of the Lackawanna Division, also made an address, in which he said that first aid is a scientific movement and is being developed along efficient and progressive lines. He called attention to the fact that today men are doing what the women started in the Crimean war, and urged them to continue their work and complimented them for their unselfish efforts in this humanitarian movement.

reference has already been made. A bronze medal was offered as a prize to the winning team, to become the permanent property of the corps winning it three times. As an additional reward for merit, the two men making the highest rating in the one-man event were sent

*Assistant inspector of equipment, Lehigh Valley Coal Co., Wilkes-Barre, Penn.

to the Mine Rescue and First Aid Conference, held by the U. S. Bureau of Mines, at Pittsburgh, Sept. 23-26.

All of the teams worked on the same problem at the same time, thus giving none the advantage of seeing the others do their work. Each team started with a credit of 100 points and were penalized according to a regular schedule of faults of omission, commission and delay.

DEMERIT SCHEDULE

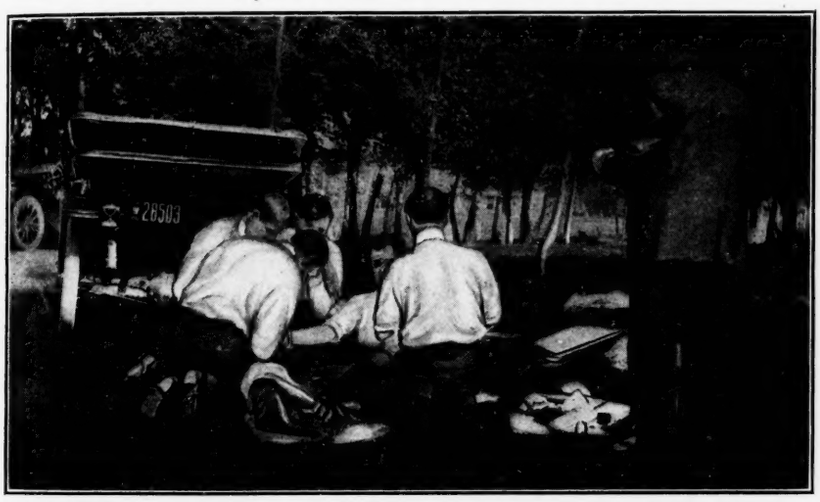
Demerits for Inefficient Work	Points
(1) Loose knot	5
(2) Loose splint	5
(3) Bandage too loose or tight	5
(4) Improper artificial respiration	10
(5) Failure to stop bleeding	10
(6) Failure to do most important thing first	5
(7) Poor team work	5
(8) Failure to care for shock	10
(9) Awkward handling of patient or stretcher	5
(10) Unnecessary handling or moving of injured part	5
(11) General carelessness or neglect	5
(12) Improper bandaging	10
(13) Miscellaneous defects in treatment	1

The teams were rated on the combined work in all of the events, no separate rating being made for each event. These ratings were given in the issue of Sept. 28, but the Primrose division which tied with Stevens and received a rating of 95 was unintentionally omitted.

Dr. A. G. Fell, of Wilkes-Barre, and Dr. E. G. Heyer, of Hazleton, acted as judges. At noon the corps and guests were served with dinner.

The six teams consisted of the following men:

Packer No. 5	Primrose
John McLean, Captain	Anthony Gludding, Captain.
Joseph Curvin	Henry O'Donnell
John Sheridan	Joseph Maher
Charles Calbert	Daniel Lewis
Henry Carey	Andrew Koenig
Thomas Brown, Subject	Ross Farr, Subject.
Westmoreland	**Drifton**
James Morris, Captain.	Rodney Shaffer, Captain.
Richard Gravel	Frances Gallagher
John Johnson	William Gillespie
Walter Jacoby	Edward Dennley
Charles Thomas	John Guida
David Buffton, Subject	Frank Carr, Subject.
Stevens	**Blackwood Tunnel**
Thos. G. Evans, Captain.	Lewis Neidlinger, Captain.
Albert Evans	William Adams
George Williams	Herbert Zerbey
John Rodda	Joseph Burkhart
Ralph Stark	Samuel Jeffries
Thomas Gravel, Subject.	E. J. Minnebaugh, Subject.



TEAM FROM PACKER NO. 5—BEGINNING OF FULL TEAM EVENT

The work of the teams throughout was excellent, the penalties which were imposed being almost altogether for small details. It was necessary to mark stringently because of the closeness of the work.

In the one-man event, Thos. G. Evans, of Stevens Colliery, and Anthony Gludding, of Primrose Colliery, were declared the winners, and were sent to the National Mine Rescue and First Aid Conference, at Pittsburgh, Penn. Atherton Bowen accompanied them and took part in the deliberations.

The Lehigh Valley Coal Co. values the first-aid meets for the social feeling thus created. The men from the many collieries meet together in these gatherings and account the holiday as one of the pleasantest days of the year.

Nanticoke Mining Institute

EDITORIAL CORRESPONDENCE

The mining institute at Nanticoke, Penn., held its second annual dinner at the commencement of the third term of its existence, on Oct. 5, at the State Armory.

There were about 700 present and the flourishing condition of the organization reflects great credit, not only on the presidents and teachers, who have given their time and effort to bring it to a successful issue, but also on R. A. Quinn, the general manager of the Susquehanna Coal Co., and C. K. Gloman, chief clerk of the manager's office.

Back of their work appears to be an interest in the advantage of the men rather than an effort to adopt institutional work as a mere company policy. This is the spirit which should animate all such endeavors. Mr. Quinn and Mr. Gloman and their associates have argued that if they were in the mines working for a living, they would want the advantages of an institute such as this, and have set about to supply it, and the Susquehanna interests, with the other companies around Nanticoke, have helped the work along financially.

The Rev. J. V. Moylan delivered the invocation and the remarks which preceded it, with great depth of feeling and impressiveness. He is one of those workers whose efforts for temperance have borne good fruit in Wilkes-Barre. William H. Morgan, the president of the institute, read his annual address, and John M. Garman, judge of the Court of Common Pleas, Luzerne County, made a witty and clever speech. After a selection by Marshall's Orchestra, R. Dawson Hall, in place of Floyd W. Parsons, made an address on local institute work in general and its significant success in the anthracite district in particular.

After a solo, by Samuel Pratt, Millard B. King, expert assistant in industrial education, discussed the question of cooperation between school boards and institutes, and the need for occupational schools. He said that a bill should be passed, enabling the state to assist such schools as liberally as those, devoted to general culture and holding day sessions.

A solo by William Roberts followed, and Major-General Dougherty and Robert A. Quinn, respectively assistant manager and general manager of the Susquehanna Coal Co., then followed with short but interesting remarks. A. P. Diffendafer, the superintendent of the Nanticoke public schools, addressed the institute on the importance of industrial classes, emphasized the fact that the German progress was based on vocational education, and that the foreign industrial trade of Germany had increased more rapidly than that of the United States. He urged that apprenticeship and the home had ceased to be sources of industrial information, and that the school must take their place.

Among the visitors were Lindley H. Dennis, expert assistant of agricultural education, Department of Public Instruction, Harrisburg. He believes that there is room for education in gardening in the mining districts. He also believes that, at little expense, our public schools in mining villages may be made more beautiful by ivies, trees and window boxes. He is willing to advise with school directors and others in mining districts relative to this phase of mine-village development.

Other visitors were Richard J. Holland, general inside foreman of the Mineral, Railroad & Mining Co., who is president of the Mt. Carmel and Shamokin Institute, and Henry G. Davies, division superintendent, Delaware, Lackawanna & Western R.R. coal department. Daniel L. Morgan is secretary and John D. Evans treasurer.

Panther Valley Mining Institute

By E. L. Cole

Four hundred employees of the Lehigh Coal & Navigation Co. were present at the first annual banquet of the Panther Valley Mining Institute, which was held in the Lansford Opera House, on Oct. 5. W. G. Whildin, general inside superintendent of the above named company, acted as chairman, and introduced the speakers of the evening.

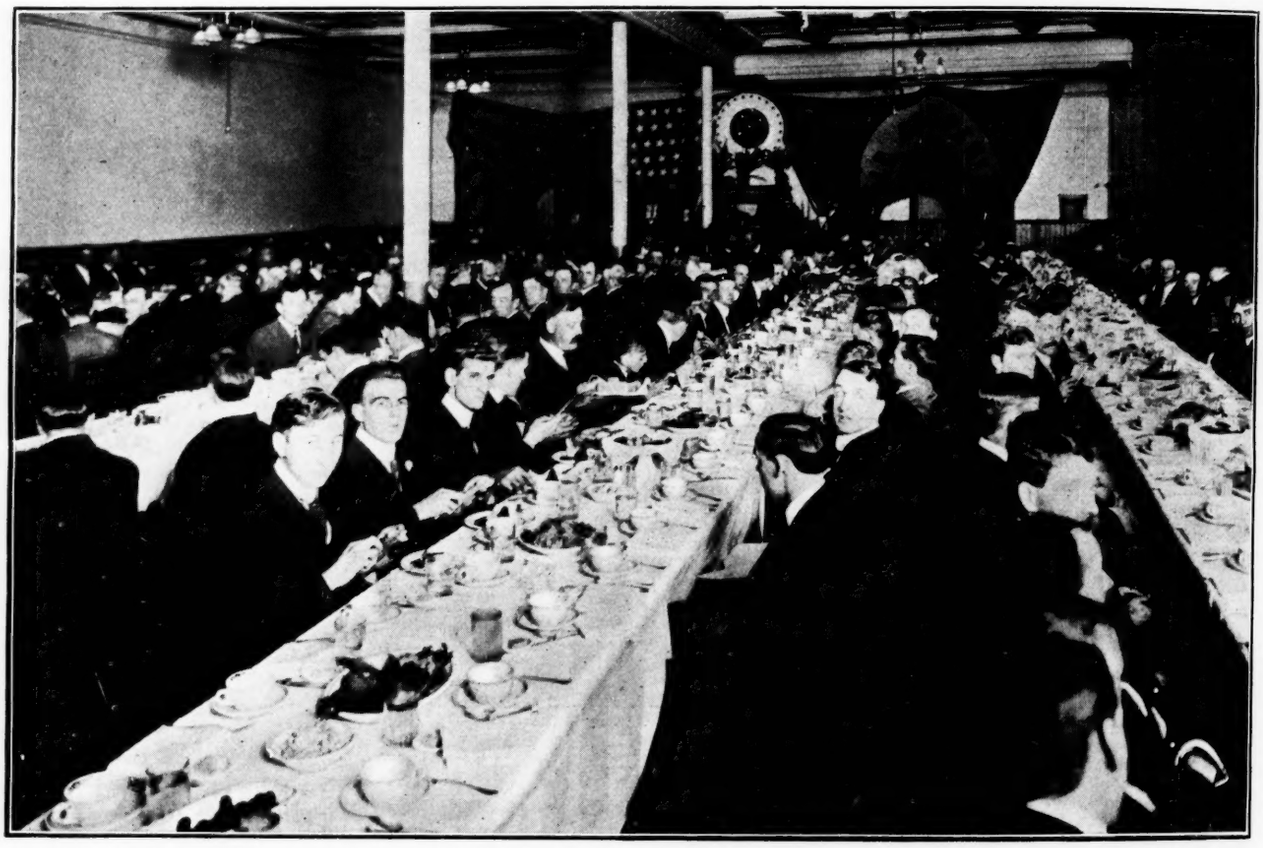
E. W. Parker, of the U. S. Geological Survey, gave an interesting talk on the statistics of the coal industry, which was a revelation to a large number of the guests, bringing home to them the tremendous part which mine workers occupy in society today, a fact which is largely overlooked by the average mine worker.

Rev. J. J. Curran, of Wilkes-Barre, compared the life of the coal miner of 50 years ago and of today. He spoke earnestly and eloquently for the further establishment of amicable relations between operator and miner. Thomas Thomas, superintendent of mines of the Lehigh Valley Coal Co., R. J. Foster, of the International Text-Book Co., and C. L. Fay, of Wilkes-Barre, all spoke earnestly of the ultimate good which mining institutes have wrought elsewhere, and so enthused the workers of the Panther Valley with their word pictures of the achievements of other institutes, that before departing the members by unanimous voice pledged their best efforts to make the Panther Valley Mining Institute second to none in the coal fields.

S. D. Warriner, president of the Lehigh Coal & Navigation Co., gave an interesting talk on the needs of the coal industry of today. He frankly stated that it was absolutely necessary for success in producing anthracite coal under the present market demands to improve continually on methods which are no longer efficient. He pointed out that the only avenue open was the education of the mine worker, who would thus be able to apply scientific methods to his work in all the diversified departments of anthracite coal mining.

He urged all employees to avail themselves of the excellent opportunity which the institute affords them of acquiring knowledge without cost to them, thereby improving their economic conditions and at the same time developing the existing methods of mining.

Four planks were emphasized as being absolutely essential to the success of any organization—Coöperation, Efficiency, Character and Advancement. It may be safely said that this gathering marks the beginning of a great educational movement, which will do much good for the mine workers of the Panther Valley.



First Banquet of the Panther Valley Mining Institute, at Lansford, Penn.

Cooperation in Safety

David S. Beyer, chief safety inspector of the American Steel & Wire Co., has this to say of the loyal coöperation of the workmen in assuring safety:

"One superintendent of our company makes out the lists of workmen's safety committees for several months and posts them in the mill, so that the men will see them and know some time ahead that they are to serve on the committee. He says that they like to see their names used in this way, and "load up" in advance for the time when they are to begin this service.

"At another plant it is customary to have one member of the foremen's committee go about with that composed of the workmen to explain and discuss any problems which may arise. Each committee makes a written report of its inspection, the recommendations of which are numbered, and the numbers of any incomplete item are all shown on a monthly statement until they have been carried out.

"Our experience with these committees has been uniformly satisfactory; benefits accrue both from the actual recommendations and from the enlivened interest which the men are taking in safety appliances. As a result of this system the attitude of the men toward protective devices has decidedly changed."

[Just one year ago, when we were planning to commence the publication of COAL AGE, *a large number of our friends who were active in various phases of the industry were consulted as to the nature and breadth of the work we might beneficially carry on. Many valuable suggestions were made us, but none of the advices has brought greater results or been more popular than the happy idea of C. L. Fay, that the time was ripe for a vigorous campaign to better the working conditions and home surroundings of the miner.*

Now, when Mr. Fay is effecting a business change which will curtail his earnest and successful efforts to advance the cause of the workman it gives us pleasure, and is only appropriate, that here in our "Sociological Department" we recognize his valued services, which have not only benefited this paper, but have promoted the welfare of the coal industry at large.—EDITOR.]

Twenty years ago, electric and compressed-air motors were being tried out in the mines of America. In the 10 years which followed, mining machines proved their ability and came to stay. The decade from 1892 to 1902 marked the triumphant genesis of the modern machine-operated mine. Thereafter the question was rather "which machinery?" than whether hand-work or machine-work would ultimately triumph.

And what of the decade which followed? It seems, as we view it from perhaps too near a view, to have inaugurated the social revolution of the industry which the coming decade is to extend and develop. The pioneer mining camp is about to become a village of homes. The mining community is to be rebuilt from the ground up. The outcome of the decade is a new view, the triumph of a vision. Little enough, perhaps; yet what is our republic but a vision? Is not a mere idea, the live steam which drives best the human machine?

The change has come about in a strange way. It has not been an evolution. The effects have been obtained by forces most unlikely to be chosen as the proper means to accomplish the purpose. Dr. Shields, now of the Red Cross Society, was a physician in an out-of-the-way mining town: Charles L. Fay was a man who was unknown in the industry. By something stronger than chance, one was to start the Shields movement, the other was to rearrange social forces by initiating the Fay institutes. The new work was a spontaneous abnormality from which a new order was to evolve.

Can you picture to yourself a more unlikely career than that of Charles L. Fay. He was born in Crawford County, Penn., and like most boys brought up in an agricultural district, was reared on a farm, for no mines are to be found in that section. For three years Mr. Fay went to a public school. He then spent two years in the iron-mining country of Michigan, afterward returning to Pennsylvania and a little later accepting a position as traveling salesman, covering a territory in Pennsylvania and Ohio. This work occupied three years, when he started into business at Hazleton, Penn., and appeared content for nine long years.

Such was the beginning of a man who was to be largely instrumental in turning the whole aspect of coal mining. Fay is a man who leads and leaders are men with obsessions. They are of a class not amenable to argument, and though men argued long and often with C. L. Fay he was not open to reason and the light

CHARLES L. FAY

of plain common sense. The operator's business did not cover looking after the miner's personal interest. He did not need to educate his men. To pay a wage he felt just, to pay it regularly, to give full weight, these are the whole duties of the mine-managing man.

Your reformer is a good listener, that is, he can keep silence during a conference. His mind, so to speak, can let the enemy through the lines and attack in the rear. Mr. Fay never let discouragement halt his purposes. He gave up his profitable business, and in the early summer of 1902 took the position of mining secretary for the State Y. M. C. A. of Pennsylvania. In August of that year he went down to Greensburg and organized the Bituminous Committee for the State. He felt the need existing for District Mining Institutes and founded them, invented them.

You who would build always on another man's foundation, who always wait for the seal of authority before crediting a paper, you do not know what ingenuity it takes to give life to a new movement and what opposition, scorn and obloquy invariably assail the innovator—till he succeeds. It is difficult, however, to size up the task this interloper had when he started to make a new era in an industry with which he had no interest in common.

In coöperation with Dr. Shields he introduced the Red Cross movement into bituminous territory. In 1907 he went to the anthracite region. In this latter section he met with the enthusiastic adherence of the coal companies. The idea had spread and all he had to do was to extend it and give it new direction and added force. From Nov. 1, 1907, till Apr. 1, 1910, he continued in charge of the work in both fields with offices at both Greensburg and Wilkes-Barre.

An illustration of the character of Mr. Fay is seen in the work he has performed for the Coal Mining Institute of America. That organization has had several good secretaries, but they were men who gave it only a small overflowing of their energy and did not make the position a leading mainspring in their lives. Mr. Fay electrified the moribund institution into life. The energy gained by the institute has caused it to be copied throughout other fields. He took a new view of the duties of secretary-treasurer as he had taken a new vision of the coal industry generally, and his pertinacity drove his purposes home.

Strange to say, Charles L. Fay has decided to slip the leash and return to business. We cannot but regret that he is no longer to be the leader in the Fay movement. We are not sure that the work he leaves is bound to succeed without the character, force and leadership of its originator. He assures us that he has no intention of separating himself entirely from the movement, that all he seeks is to give it his best endeavors without profiting by its success in any financial way. Should it show signs of weakening, we hope he will return and put back that vim which he may find has evaporated with his absence. For ideas are subtle things. Forceful, pulsating as they may be when the thinker urges them, they often die as soon as his personality is withdrawn.

In England, acetylene mine lamps are used to some extent in gaseous mines. They are fitted with a water-and-gas-shut-off device, by which the admission and shut-off of both water and gas are effected by the same cock, constructed in such a way that by a quarter turn to the right the water, and by a further turn the gas, is shut off thereby instantly extinguishing the light. The flame can be so easily regulated that 1 per cent. of firedamp can be detected. A 20-cp. acetylene lamp with an overbend reflector is sometimes used in nongaseous mines.

Inquiries of General Interest

All Questions Must be Accompanied by Name and Address—Not for Publication

Effect of Carbon Monoxide on a Lamp Flame

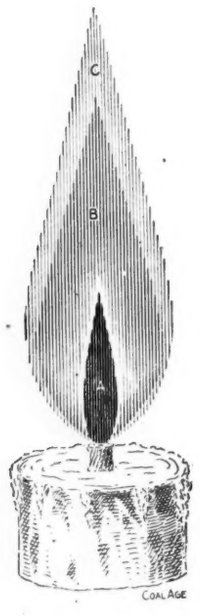
Please describe the nature of flame, and explain why a lamp flame will burn more brightly when carbon monoxide is present in the atmosphere.

FIREBOSS.

Pittsburgh, Penn.

In the burning of an oil lamp there are three steps or stages intervening between the liquid oil and the final luminous flame. First, the oil is drawn up by means of the capillary attraction existing in the wick. Second, the heat of the flame distills volatile hydrocarbons from the oil. Third, the distilled gases are burned with the production of heat and light.

The accompanying illustration represents the flame as made up of three different zones, which are determined by



CANDLE FLAME SHOWING THREE ZONES OF COMBUSTION

the successive stages that occur in the combustion of the oil. The inner zone *A* consists of unburned gases distilled from the oil. The temperature in this zone is maintained by the heat of the combustion in the surrounding zone *B*. Although these gases may have reached the temperature of ignition, the lack of oxygen in this inner zone *A* prevents their combustion, which makes this zone nonluminous.

The combustion of the hydrocarbon gases distilled from the oil is accomplished in the two outer zones *B* and *C*. These two zones differ from each other in the degree of combustion, which is determined by two conditions; first, the amount of air (oxygen) that reaches the zone; and, second, the partially extinctive effect of the products of the combustion of these gases.

The middle zone *B* is luminous, and the outer zone *C* is nonluminous. The reason for this is apparent on reflection. The supply of oxygen to the middle zone is not sufficient for complete combustion; and, as a result, some carbon is set free, which is at once made incandescent by the heat of the flame. It is this incandescent carbon that produces the light.

An ample supply of oxygen is available in the outer zone *C* where the combustion of any remaining gases and the carbon is complete. The dilution of the flame by the large supply of air is thus the indirect cause that renders this zone nonluminous.

To explain the increased brightness of a flame burning in the presence of carbon monoxide, it is necessary to remember that this gas is combustible, and its presence in the air surrounding the flame increases the temperature of the outer zone *C*, by reason of its combustion in that zone. As a result, the temperature of the middle zone *B* is increased and the combustion of carbon in this zone takes place at a higher temperature, thus producing a greater degree of luminosity, or a brighter light. Any influence that increases the temperature of the outer zone or conserves its heat will, in this manner, increase the brightness of the flame.

Specific Gravity and Density

Explain the meaning of specific gravity, and state what is its practical use in mining. Does the term "specific gravity" have the same meaning as the word 'density"?

INQUIRER.

Springfield, Ill.

The term "specific gravity" describes the relative weight of substances, referred to the weight of an equal volume of a certain substance taken as a standard. The adopted standard for solids and liquids is water at its maximum density. The weight of 1 cu.ft. of water, at maximum density, is 62.4283 lb. In practice, however, except in cases where extreme accuracy is desired, the weight of a cubic foot of water is taken as 62.5 lb. Multiplying this weight by the specific gravity of any solid or liquid gives the weight of a cubic foot of that solid or liquid, in pounds.

For example, taking the average specific gravity of bituminous coal as 1.3, the weight of a cubic foot of this coal in the solid, would be

$$62.5 \times 1.3 = 81.25 \text{ lb.}$$

The adopted standard for gases is air at an equal temperature and pressure. For example, taking the specific gravity of carbon dioxide (CO_2) as 1.529, and assuming the weight of 1 cu.ft. of air, at 60 deg. F., and a barometric pressure of 30 in., to be 0.0766 lb., the weight of a cubic foot of carbon dioxide, at this temperature and pressure, is

$$0.0766 \times 1.529 = 0.1171+ \text{ lb.}$$

The term *specific gravity* is correlative with density, but is used in a somewhat different sense, having reference to the relative weights of substances, while *density* relates more particularly to the relative compactness of the material forming the substance.

It is common to speak of the density of air and gases, referred to that of hydrogen as unity. In this case, the density of any gas is exactly one-half of its molecular weight, since the molecule of hydrogen is assumed to have two atoms and the size of all gaseous molecules is equal.

For example, the molecular weight of carbon dioxide (CO_2), since C = 12, and O = 16, is 12 + 2(16) = 44. The density of this gas, referred to hydrogen as unity, is, therefore, 44 ÷ 2 = 22. That is to say, carbon dioxide is 22 times as heavy as hydrogen, at the same temperature and pressure.

Since air is practically 14.4 times as heavy as hydrogen, the specific gravity of the same gas, referred to air as unity, may be calculated by dividing its density by 14.4.

For example, the calculated specific gravity of carbon dioxide is 22 ÷ 14.4 = 1.528, which closely approximates the specific gravity of the gas as determined by experiment.

Again, to find the weight of 1 cu.yd. of coal, the specific gravity of which is 1.4, since there are 27 cu.ft. in a cubic yard, and, since the weight of 1 cu.ft. of water is 62.5 lb., the weight of a cubic yard of coal, having a specific gravity of 1.4, is

$$27\ (62.5 \times 1.4) = 2362.5 \text{ lb.}$$

Examination Questions

Selected from State Examinations, or Suggested by Correspondents

Selected Examination Questions

The Barometer

Ques.—Explain how the barometer reading assists in determining the vertical lift of a pump.

Ans.—The atmospheric pressure acting on the surface of the water forces it up the suction pipe to the pump; but, owing to the friction of the water in the pipe, which increases with the length of the pipe, the condition of its inner surface, number of bends, etc., the vertical head, in pumping, is considerably less than the water column the atmospheric pressure will support.

In pumping practice, the vertical lift in feet, will vary from $\frac{9}{10}$ to $\frac{9}{10}$ of the barometric pressure in inches, according to the conditions stated above. For example, for a pipe in good condition, having a short vertical lift with no bends or other obstructions; the suction head, corresponding to a barometric pressure of 30 in. (sea level), may be estimated as $0.9 \times 30 = 27$ ft.

Where the suction pipe is much inclined, however, its length is increased and if the pipe is in poor condition, or has many bends or other obstructions such as valves, the vertical lift corresponding to 30 in. barometric pressure under these conditions, may be taken as $\frac{8}{10} \times 30 = 24$ ft. Under specially poor conditions, the suction head may be much further reduced; but the barometric reading furnishes a base of calculation to determine the same.

Ques.—Where should the barometer be placed at a mine and how often should it be read?

Ans.—A good mercurial barometer should be placed in the office, near the opening of every large mine. The mine foreman and his assistants including the firebosses, should carefully observe the barometer upon entering and leaving the mine. The barometer should also be constantly observed by the one in charge of the office, who should at once report to the mine foreman or his assistants any sudden change.

The importance of these changes as affecting the security of the mine will depend largely on the conditions underground. Barometer readings are more important in the operation of a large mine generating gas, and having a greater or less abandoned area. When the barometer falls the gases accumulated in abandoned areas expand under the decreased pressure, which results in a portion of the gas-laden air being thrown out on the airways. Under these conditions, a sudden fall of barometer is often accompanied or followed by a dangerous condition of the mine atmosphere.

Ques.—Explain, in a few words, what is meant by an aneroid barometer, or simply, an "aneroid."

Ans.—The aneroid is a small portable instrument so constructed as to register on a dial, any changes in atmospheric pressure. It consists of a vacuum box from which the air has been exhausted.

The Aneroid

The sides of the box are corrugated, to render them pliable and sensitive to the pressure of the atmosphere. They are held apart by a spring, which prevents their collapse under the pressure of the atmosphere. As the atmospheric pressure increases or decreases, the sides of the box move in or out; and this movement is communicated, by a series of levers and gears, to the hands of a dial.

The instrument is graduated and calibrated to correspond to the readings of the barometer, in inches of mercury. The best aneroids are compensated for temperature, so that their readings are approximately reduced to the standard barometric readings.

A Question in Natural Splitting of Air Currents

Ques.—(a) Find the natural division of an air current of 100,000 cu.ft. per min. between the following two airways or splits: Split A, 6x8 ft., 1000 ft. long; split B, 6x12 ft., 5000 ft. long. (b) Find the pressure, water gage, mine resistance and horsepower on the air, in this circulation.

Ans.—(a) The first step is to find the area, perimeter and length of each airway or split, and reduce these to the lowest relative areas, perimeters and lengths; thus,

Split A,

$a = 48$ sq.ft.; $o = 28$ ft.; $l = 1000$ ft.

Split B,

$a = 72$ sq.ft.; $o = 36$ ft.; $l = 5000$ ft.

Reducing these values to the lowest relative areas, perimeters and lengths, we have

A, $a = 2$; $o = 7$; $l = 1$

B, $a = 3$; $o = 9$; $l = 5$

The next step is to find the potential values for each split, by substituting the lowest relative values just found for a, o and l in the expression for mine potential, $\sqrt{\frac{a}{lo}}$.

A, $2\sqrt{\frac{2}{1 \times 7}} = 2\sqrt{0.2857} = 1.068$

B, $3\sqrt{\frac{3}{5 \times 9}} = 3\sqrt{0.0666} = 0.774$

Sum of potentials..... 1.842

The quantity of air passing in each split is then found as follows:

A,

$\frac{1.068}{1.842} \times 100{,}000 =$ say 58,000 cu.ft. per min.

B,

$\frac{0.774}{1.842} \times 100{,}000 =$ say 42,000 cu.ft. per min

Total..... 100,000 cu.ft. per min.

(b) Since the pressure is the same for all the splits, it can be calculated for the entire circulation by substituting the values for any one of the given splits in the formula

$$p = \frac{k l o q^2}{a^3}$$

Thus, taking split A, and using the coefficient $k = 0.02$, and expressing the quantity of air in thousands of cubic feet per minute, we have,

$$p = \frac{0.02 \times 1000 \times 28 \times 58}{48 \times 48 \times 48} = 17.03 \text{ lb. per sq.ft.}$$

The water gage corresponding to this pressure is

$$w.g. = \frac{17.03}{5.2} = 3.27 \text{ in.}$$

The mine resistance in this case is found by multiplying the unit of ventilating pressure just found by the total sectional area of the two splits; thus,

$$R = p\,a = 17.03\,(48 + 72) = 2043.6 \text{ lb.}$$

The horsepower on the air is found by multiplying the total quantity of air in circulation, by the unit pressure, and dividing by 33,000; thus,

$$H = \frac{Q\,p}{33{,}000} = \frac{100{,}000 \times 17.03}{33{,}000} = 51.6 \text{ hp.}$$

Coal and Coke News

From Our Own Representatives in Various Important Mining Centers

Washington

An extensive investigation of the conditions respecting car shortage on the different railroads of the country is being planned by the Interstate Commerce Commission, and will probably be inaugurated in the near future. The preliminary steps have already been taken. With respect to coal, the situation is said to be particularly unsatisfactory, and it is alleged that the commission will pay an extra amount of attention to the shortage of cars for the transportation of that article. Special complaint is made because the coal roads are said to have been allowing very extensive reconsignment periods. The difficulties due to this cause are believed to be especially bad in the anthracite regions, where box cars are largely used. Scores of complaints about the car shortage, many of them referring specifically to the lack of coal cars, have reached the commission, and have been receiving the attention of some of its members already. Commissioner Lane is giving a large amount of study to these letters of criticism, and appeals for assistance, which come from shippers. He believes that the trouble is largely due to the holding of the cars idle in great numbers around such cities as Boston, Baltimore, Philadelphia and New York, they being there used as a means of storage. There is a disposition at the commission's offices to charge that this privilege of using the cars for storage is one that is accorded particularly to the friends of officials of the roads. At all events, much of the shortage is assigned to that cause. The commission, however, intends to devote particular attention to the general question of shortage in all lines and will not confine its attention simply to coal. Its notice thus far has been particularly attracted to the situation as concerns the latter article, because of the difficulty in some quarters of getting coal and the belief that this trouble in many instances has been due not so much to the actual lack of coal, as to the lack of facilities for transportation.

The Interstate Commerce Commission opened its fall hearings on Oct. 7. These hearings will include some final arguments on the question of the rates on the coal-carrying roads. There has been a hope in some railroad quarters that the consideration of the rates on the coal roads would result in a more favorable finding for the carriers than has been rendered in other rate cases of late. It is difficult to see on what this idea has been based. In fact, there is a good deal of evidence to show that the arguments that have reached the commission from railway men, who believe rates have been unduly kept down, do not apply, even in the minds of their authors, to the coal roads. It is felt that the charges on these roads are primarily responsible for the present prices of coal, and the commission is apparently disposed to help solve the problem of the high cost of living in some degree by reducing the freights now charged. The fact that the interests which control the coal-carrying roads and those which control the coal itself are similar, and in some cases identical, has prevented complaint from being heard from the shippers' side. But the present agitation before the commission starts with those who are dissatisfied with what they have to pay for coal and who assert that the expert information in the possession of the commission is proof positive of the fact that the current high retail rates for coal cannot be assigned to the cost of mining, but must be attributed to conditions of transportation. If a start is made at the revision of the rates on the coal roads, the commission will be obliged to carry its investigations and rulings over a very extended field in order to keep them uniform.

Pennsylvania

Anthracite

Scranton—A canvass of the collieries here tends to confirm the statement of the anthracite operators' committee that there is no coal shortage. There is no surplus, but enough coal is being produced to supply all demands. The mines are being worked to their fullest capacity, and considerable headway is being made in the effort to make this year's output come up to that of last year.

Pottsville—Blackwood colliery, the largest of the Lehigh Valley Coal Co.'s holdings, south of the mountains, shut down, Oct. 1, for repairs and improvements. When completed it is expected that the colliery will be able to increase its coal output 40 per cent.

Wilkes-Barre—A mine cave occurred recently under the house occupied by George McKelchnie, of Courtdale. The building in settling turned on end. This is the second cave to occur at the same place within the past year. The property is undermined by the Kingston Coal Co.

Bituminous

Charleroi—Negotiations have been closed whereby the Meadowlands Coal Co. has come into full possession of the J. G. Morrison tract of coal. This tract consists of 98.491 acres, the consideration paid being $78,792.80, or at the rate of $800 per acre.

The drilling of test holes in the Centerville community by the Vesta Coal Co., has been completed. It is stated that the Vesta people are testing the lower vein of coal, which is said to be of an unusually good quality, and should it be operated, it would require the installation of shaft mining.

Sharon—With the resumption of blast furnace No. 3, after an eight months' idleness, the Carnegie Steel Co. started its three batteries of coke ovens. This is the first time in two years that the Sharon and Farrell works of the Carnegie company have been running at full capacity.

Indiana—The Manor Real Estate Co., of Philadelphia, is closing deals in Indiana and Cambria Counties for a large block of coal lands. Over 2000 acres will have changed hands in this county within a short time. The prices paid are the highest that have been given for some time.

All prospects of the Graff Coal Co.'s mines, in Blacklick County, resuming operations, have been abandoned. These mines have been practically idle for about a year. By the closing down, about 100 men have been out of employment.

Pittsburgh—A great deal of activity is being reported in the central Pennsylvania coal field in the purchase of large areas of coal. The new buyers are understood to be operating companies or companies preparing for operations in that field.

Eriton—At a meeting of the miners of the Eriton operation, held Oct. 2, propositions advanced by General Manager Fulford, were all accepted. It was voted to resume work at once, so that after four days of idleness the mining of coal once more began.

Rossiter—Amicable settlement has been accomplished between the striking miners and the Clearfield Bituminous Coal Corporation, at this place. The reinstatement of two discharged employees, the request regarding the tare weights of cars, and loading of cars on headings,

which were the points of contention, were all acceeded to by the management.

West Virginia

Wheeling—It is understood that the Yorkville Coal Co. will shortly erect about 160 residences for its employees in this vicinity. It is intended to lay out a miniature city with streets and alleys located in readiness for future growth. The understanding is that the houses will be sold to the men on reasonable terms.

Charleston—Six companies of West Virginia militiamen in the Cabin Creek and Paint Creek coal districts returned to private life Oct. 2, after being in the field since July 29. Military authorities are inclined to view the situation as greatly improved.

All men who went on strike at the Carbondale and National mines and from the Elkridge mine on the north side of the Kanawha River, went back to work Oct. 3, after two days' idleness.

Maryland

Baltimore—Record prosperity is being realized by bituminous coal operators in this district. Every mine owned by the Consolidation Coal Co. in Maryland, Pennsylvania, West Virginia and Kentucky is being operated to its full capacity and the output is at the rate of 1,000,000 tons a month.

Alabama

Birmingham—Only three fatal accidents occurred in the coal mines of Alabama during the month of September. This is one of the lowest death-rate records for a month that has occurred in many years.

Sloss mine No. 1, which has been flooded the past few weeks, has been practically cleared of water. It is understood that work will be resumed soon.

The Alabama Fuel & Iron Co. is opening a new slope near Margaret Mine to develop the Harkness Seam. This slope will be equipped throughout with the most modern machinery and when complete will be one of the most modern mines in the South. It is the intention to start the dumping of coal by Jan. 1 next.

Tuscaloosa—It is announced that 3000 acres of coal land in this vicinity have been leased by parties from Birmingham. These operators will make at least two openings for the development of this land.

Russelville—The Sheffield Coal & Iron Co. has a good force of men at work upon the necessary repairs to its mine. It employs from 200 to 250 men when in operation and it is estimated that it will require about two weeks to complete the repairs.

Tennessee

Pruden—The Pruden Coal & Coke Co. has just completed the expenditure of $48,000 in installation of new machinery and tipple at its mines at Pruden. The capacity of these mines has been brought up to 1000 tons per day and they are considered among the most modern in the district, everything being run in first-class shape.

Knoxville—Ducktown, Polk Ave., mines will soon be in operation again, and it is expected that a considerable number of men will be given employment.

Walling—The Van Buren County Tennessee Coal Co. will shortly begin the development of 10,500 acres of coal land near Walling, Tenn. The company was recently incorporated with a capitalization of $1,000,000 and a $650,000 bond issue. It plans facilities for a daily output of from 1500 to 2000 tons, the construction of a ten-mile railway and the building of coke ovens.

Kentucky

Corydon—Corydon Coal Co. has resumed operations after making a number of new improvements among which was a new boiler, new screens and other general improvements.

Benham—The Wisconsin Steel Co., a coking plant of which is located at Benham, Ky., has put 300 coke ovens in operation, and will shortly complete 200 more.

Clay County—Eastern capitalists are said to have purchased a big tract of land in Clay County, Ky., for a consideration of $600,000. An early railroad extension into that section is being urged, and railroad men are considering the proposition.

Lexington—The hearing for the adjustment of coal rates from the mines to Lexington, Ky., asked for by the Lexington Commercial Club, has been postponed by the State Railroad Commission at the request of representatives of the Louisville & Nashville R.R.

Pine Hill—The Kentucky Portland Cement & Coal Co. is developing coal lands, besides manufacturing portland cement. The domestic coal is being marketed, while the steam coal is being used in the manufacture of the cement. The company has 130 men on its payroll at Pine Hill.

Knox County—New purchasers of a large body of coal and timber lands on Stinking Creek, Knox County, Ky., sold by F. D. Sampson and Samuel Bennett, are abstracting titles and going over their new holdings. The tract will be held for future development, as it is at present inaccessible.

Ohio

Rogers—With the arrival of machinery at the Quaker Valley mines and a force of men to install it, indications for the opening of the mine at some date in the near future, have brightened. Mine officials say that by Nov. 1, the whistle will blow for work to begin and that the mine will be operated to the fullest extent.

Coshocton—After standing idle for two weeks the Tyrone mine of the Davis Co., located near Coshocton, Ohio, resumed operations Oct. 2. Within a few days it is expected to have 75 men at work. The suspension was caused by a strike of the miners.

Columbus—Judge Sater, of the United States Court in Columbus, Ohio, has handed down a decision in which the verdict of $64,000 granted the New York Coal Co. against the Hocking Valley Ry. Co. two months ago by a jury for alleged discrimination in coal-carrying facilities was reduced to $42,750. The original verdict returned by the jury was declared excessive by Judge Sater.

Indiana

Seeleyville—The miners who were driven from the Rosebud Mine, near Seeleyville, belonging to the Vandalia Coal Co., by fire and smoke, have returned to work after several days of enforced idleness.

Evansville—The differences between the "top" men and the Diamond Coal Co. have been settled and the mines have been reopened with a full force of miners. These men have been out for several weeks and rejoice to get back.

Illinois

Lincoln—Coal rights valued at $1850 have been purchased by the Frorer Coal Co. within the past few days, and the company will start working in the near future.

Farmington—Farmington coal miners are busier now than they have been for more than a year. Practically all of the mines are working from four to six days every week, with promises of every day in the near future.

Montana

Pending the action on the proposed new wage scale prepared at a conference of the mine owners and representatives of the United Mine Workers of America, every coal miner in Montana walked out, Oct. 2, when the former wage agreement expired. It is expected that the new agreement will be accepted.

Oklahoma

McAlester—A blown-out shot late in the evening of Sept. 26 caused the death of one man and set fire to the Rolan-Darnell mine at Craig, Okla. For a time it was believed that two men were entombed in the burning mine, but this proved to be a mistake. All the miners except the two shotfirers had left the mine when the explosion occurred.

Personals

Rush N. Hosler, chief engineer, Morrisdale Coal & Coke Co., is now chief mining engineer of the Indiana district B. R. and P. interests.

Congressman Bascom Slemp, of the ninth Virginia district, owner of large holdings of coal and timber in Kentucky, has announced that he will shortly begin their development.

C. L. Patterson, who has been with the engineering department of the H. C. Frick Coke Co., has resigned his position to go with the Etna Connellsville Coal & Coke Co. at its Simpson plant as superintendent.

J. M. Webb, mining expert, formerly engaged in the government rescue work at Urbana, Ill., has been placed in charge of the rescue station at West End, Ala., temporarily. Since the resignation of A. R. Brown there has not been a government expert in charge.

Construction News

Mobile, Ala.—One of the new colliers to be used in the harbor of Mobile is in the course of construction at Pastorgagoula. It will cost approximately $30,000, and will be used at Mobile to coal ships at this port, using coal from the Birmingham district.

Philadelphia, Penn.—The Girard Estate has decided to throw open for lease several of its richest deposits of coal in the Schuylkill district. The leases for mining coal on this land for 99 years will be awarded to the highest bidder this week. About 15 bids have been received.

Pittsburgh, Penn.—The Poland Coal Co. of Pittsburgh is erecting a tipple at the mouth of Dunkard Creek, in Monongahela Township, Greene County, to take out 1110 acres of coal. The company will erect coke ovens and dwellings. The Monongahela Railroad Co. has extended its tracks into the new coal field.

Scranton, Penn.—Discovery of rich coal deposits at Archbald near this city has caused the Delaware & Hudson Co. to begin improvements involving an expenditure of $1,000,000. Several shafts and drifts are being driven into the new vein, which is about 7 ft. thick, and a large concrete breaker is being erected.

Pottsville, Penn.—One of the greatest moves contemplated here is the erection of one of the largest breakers in this section at Broad Mountain at what is known as the Chaunce Colliery by Neal & Thorn, the owners of the Buck Run operation and other big mining interests in this section. The breaker is to be a big concrete structure.

Fort Wayne, Ind.—Work upon the foundation for a modern coaling station in Ft. Wayne for the Wabash will commence in a few days. The Hannan-Hickey Railroad Construction Co. has a contract for concrete work, and they are now making preparations for it. The building will extend over two of the main tracks and a roundhouse track and will have a capacity of about 200 tons of coal.

Detroit, Mich.—The Detroit Ship Building Co. has received an order for two new steel freighters from the A. Geo. Hall Coal Co. The new steamers will have a carrying capacity in deep water of about 3000 tons each. It is understood that the contract involves approximately $400,000. The steamers are to be ready for delivery early next season and will be operated in the coal trade on Lake Ontario and the St. Lawrence River.

Latrobe, Penn.—It is said that 7000 acres of land lying along the Loyalhanna Creek in Ligonier and Cook townships, and extending from Mechanicsburgh south have been been optioned for a period of six months for Eastern capitalists, and that if the deal is consummated there will be development of coal and timber. One report has it that the Western Maryland contemplates a branch from Connellsville to its line in Indiana County.

Beattyville, Ky.—A new branch line of the L. & N. is to be constructed from Beattyville, on the Kentucky River, to Athol, Ky., located on the Lexington & Eastern. Though the new road will be but nine miles long, it will open up a territory rich in coal. The L. & N. is also planning the construction of a new road from the Ohio River at Covington, Ky., to the coal fields at the head of the Kentucky River. Announcement as to the route and length is expected to be forthcoming in the near future.

New Incorporations

Moundsville, W. Va.—Parrs Run Coal Co., Moundsville, W. Va., has incorporated with $100,000 capital stock to develop coal properties.

Ashland, Ky.—Henry Coal & Coke Co.; principal office and chief works in Ashland, Ky.; capital, $200,000; subscribed $500. Incorporators: John F. Hager, J. W. M. Stewart, S. S. Wills, John M. Hopkins, all of Ashland.

Charleston, W. Va.—The Panama Coaling Co. of West Virginia has been incorporated with a capital stock of $5000 for the purpose of mining and manufacturing. Incorporators, Geo. E. Price, Harrison T. Smith, R. F. Stilman, Buckner Clay and C. M Price, all of Charleston, W. Va.

Greensburg, Penn.—State charters have been issued to the Fairfield Coal & Coke Co. and Hammil Coal Co., both of Greensburg; capital of each, $5000, with the following incorporators: C. S. Hammill, Grafton; G. E. Snively and A. C. Snively, Irwin.

Columbus, Ohio—The Chapman Fuel Co., of Columbus, has been incorporated with a capital stock of $100,000. Incorporators are Henry N. Rose, F. B. Chapman, S. L. Quinn, C. J. Benton and A. M. Fisher. The same persons incorporated the Perry County Coal Co., of Moxahala, with $200,000 capital stock.

Richmond, Va.—Beaver Creek Mining Corporation, Richmond, Va.; capital, $1000 to $50,000. Felton Dent, president; Noah H. Savage, second vice-president, both of Philadelphia, Penn.; Frederick S. Ruth, secretary and treasurer, New York; Thomas B. Gay, H. H. Chalkley and Ernest B. Flippen, all of Richmond.

New York, N. Y.—An evidence of the increasing attention being given to the most efficient methods of advertising and marketing engineering and technical products appears in the announcement of the formation of Wightman & Richards, technical department of Jos. A. Richards & Staff, general advertising agents, Tribune Building, New York City, representing the association of Joseph A. Richards, Lucius I. Wightman and Paul Morse Richards.

Industrial News

Connellsville, Penn.—The Lacoole Coal Co. composed of Greensburg people are opening their coal property near Bolivar.

Connellsville, Penn.—The Loyalhanna Coal Co. is getting ready to develop a coal tract near Reitz, Somerset County.

Elaine, Ark.—Gerard B. Lambert & Co., Elaine, Ark., will buy and develop 20,000 acres of timber land in Phillips County.

Russelville, Ala.—Sheffield Coal & Iron Co. has begun necessary repairs on their mines. They employ from 200 to 250 men.

Philadelphia, Penn.—The Reading anthracite shipments in September were about 1,180,000 tons, as compared with 1,286,000 tons in August.

Birmingham, Ala.—W. J. Gilmore, Birmingham, Ala., plans development of coal land near Tuscaloosa, daily capacity to be from 1000 to 1500 tons of coal.

Fayetteville, Ark.—United Fuel Co., Fayetteville, Ark., will develop coal land and plans a daily capacity of 3000 tons, with a steam and electric driven equipment, to cost about $150,000.

Wilkes-Barre, Penn.—Work has been started by the Lackawanna Coal Co. at sinking a shaft along the Parsons and Plains line in Luzerne County, near the point where the trolley line crosses.

Cambridge Springs, Penn.—The Cambridge Springs Supply Co. takes possession and control of the John F. Himebaugh coal business, the former having bought out Mr. Himebaugh.

Chicago, Ill.—The West Virginia White Oak Coal Co. has conveyed to the Coal Supply Co. the property on 59th St., 125 ft. west of Lafayette Ave., 62 ft. north from 60th St., fronting west of the Rock Island Road, for $40,000.

Dante, Va.—The Clinchfield Coal Corporation, Dante, Va., is adding to the equipment of its mine at Hurricane, W. Va., two 6-ton 48-in. gage electric mining locomotives, which will be furnished by the General Electric Co.

Pittsburgh, Penn.—Preparations are being made to start the Duquesne plant of the Bessemer Coke Co. in Bradenville. Men are clearing the entries and rooms of the mine, and it is thought the plant will be in active operation soon.

Parker, Penn.—Geo. K. Pollack, of Perry township, Clarion County, has sold the limestone and coal rights underlying his farm to a company of Pittsburgh capitalists headed by T. N. Barnsdall. The limestone will be taken out by drifting.

Sullivan, Ind.—Drillers are sinking test holes for the Consolidated Indiana Coal Co. near Shelburn, in Sullivan County. A new shaft will be sunk to No. 3 vein. Other coal companies are preparing to push development likewise in this county.

Monongahela, Penn.—The E. D. Neil Construction Co., which is sinking a new air shaft for the Catsburg mine on the Sampson farm near Frye station is making satisfactory progress. The shaft is to be used in conducting air through the Catsburg workings.

Baltimore, Md.—Geo. C. Jenkins, chairman of the bondholders' committee, has purchased for $200,000 the property of the Cumberland Basin Coal Co. and the Cumberland Basin Land Co., including 65,000 acres of coal land in Allegheny County, Maryland, and Somerset County, Penn.

Kittanning, Penn. — The Allegheny River Mining Co., Kittanning, Penn., is adding three 8-ton, 42-in. gage electric mining locomotives to the equipment of its collieries. The locomotives have been ordered from the General Electric Co.

Woodsfield, Ohio—Some Pittsburgh and Uniontown people, together with local capitalists, will organize a company whereby they will take over all the coal lands owned by Messrs. John and Berkeley. Operations will begin as soon as practicable. The company will be incorporated as the Pittsburgh & Ohio Coal Co.

Coleanor, Ala. — The Blocton-Cahaba Coal Co., Coleanor, Ala., is installing for electric drive in its collieries new equipment, consisting of a 375 kv.-a. generator with 25 kw. exciter, necessary transformers and switchboard, and three motors of 12, 20 and 75 hp., respectively. All this apparatus is being obtained from the General Electric Co.

Walling, Tenn.—Van Buren Co. Tennessee Coal Co., Austin, Tex., has been incorporated with $1,000,000 capital stock and $650,000 bonds, to develop 10,500 acres of coal land near Walling, Tenn., the daily capacity to be 1500 to 2000 tons of coal; plans include constructing a 10-mile railroad, building coke ovens, etc.

Philadelphia, Penn.—President Bodine, of the United Gas Improvement Co., has issued a statement of earnings of the company for the half year ending June 30. The figures show that after providing for the dividends for six months and setting aside a sum for sinking fund purposes there was left a surplus amounting to about 1.45 per cent. upon the capital stock outstanding.

Washington, Penn. — Meadowlands Coal Co., which operates extensively in Chartiers Township, closed up matters yesterday whereby it comes into full possession of the J. G. Morrison tract of coal in that township, over which there has been litigation for several months. The Morrison tract consists of 98.291 acres. The consideration paid for the coal was $78,792.80, or at the rate of $8000 an acre.

Ligonier, Penn.—That the Western Maryland R.R. Co. may come to Ligonier from Connellsville is the report in circulation here. The company, it is said, contemplated building a road down through the valley to connect with this road's interest in Indiana County, crossing over near the Packsaddle west of Bolivar and touching at Blairsville. This would mean coal developments the entire length of the Ligonier Valley.

Vincennes, Ind.—This week witnessed the payment of $60,000 to the property owners in the vicinity of Bruceville for the coal rights under their land by the Martin-Howe Coal Co., of Chicago. In all 1750 acres were leased this week, and it is expected that before long some 4000 acres will be under contract. It is the expectation of the operators to start work in the spring and to this end it is probable that a shaft will be sunk near Bruceville.

Tuscaloosa, Ala.—Big development is about to be started in the Tuscaloosa County coal fields. There have been several transactions in virgin coal lands in Tuscaloosa County since the new railroad has been completed. A. J. Gilmore and brother, of Birmingham, are opening two drift mines, while preparations are being made by others to open mines in the near future. The coal lands are not far removed from the Warrior River, which is navigable as far as Tuscaloosa city, to which place the new railroad extends.

Reading, Penn.—With the many improvements that the Reading is making at Alaska shaft, west of Locust Gap, that operation promises to be one of the most modern in this coal field in the very near future. From present indications it is likely that the work of sinking the shaft to the Lykens vein at Beaverdale will commence in about two weeks. Electric pumps are to be installed by the Wyoming Valley Water Co. at the big Brush Valley plant. The work of remodeling the old People's power plant at Mahanoy city, into a substation has begun. The patrons will get their light from the Hazleton plant.

Book Review

DIFFERENTIAL AND INTEGRAL CALCULUS. By Lorrain S. Hulburt. 6x9 pp. 481 + xviii; illus. Longmans, Green & Co. New York.

Except an engineer use his calculus constantly, the major portion of it is soon forgotten. When needed, it is, of course, most convenient to refer to the book he used in college. If, however, the book he formerly used is lost, and a new one is to be bought, we recommend this volume for consideration.

To the engineer, it is of chief interest to know that apart from following the ordinary lines of an elementary textbook, there is also a short chapter on differential equations and also something on hyperbolic functions. There are many problems on kinematics, although none on dynamics, as that is more particularly the field of a textbook on mechanics. Of course, the geometric subjects of convexity, concavity, flexes, maxima and minima, are all treated fully. What is also an advantage to the engineer is the omission of many long rigorous proofs; results are there, which are the things needed; why these results should be so under every possible and impossible condition of $f(x, y)$ can be omitted.

While we have written the above from an engineer's standpoint, we believe the book can be still more highly recommended from the teacher's, especially in engineering schools.

Recent Coal and Coke Patents

AMERICAN

Miner's Lamp. S. W. Metz, Beaver Falls, Penn. 1,038,930, Sept. 17, 1912. Filed Dec. 9, 1911. Serial No. 664,727.

Clam Shell Bucket. C. J. Young, Wash., 1,037,570, Sept. 3, 1912. Filed Sept. 16, 1911. Serial No. 649,619.

Miner's Lamp. E. C. Mangin, Colorado Springs, Col. 1,037,948, Sept. 10, 1912. Filed March 28, 1912. Serial No. 686,924.

Smoke Diluter. N. Bengincasa, Pittsburgh, Penn. 1,038,270, Sept. 10, 1912. Filed Sept. 21, 1910. Serial No. 583,058.

Apparatus for Coaling Ships. M. S. Iverson, New York, N. Y. 1,038,588, Sept. 17, 1912. Filed Nov. 26, 1907. Serial No. 403,954.

Dumping Lever for Ore Cars. P. R. Stanhope, Denver, Col. 1,038,674, Sept. 17, 1912. Filed Nov. 25, 1911. Serial No. 662,447.

Apparatus for Coking Briquets. Paul Hein, Essen-Ruettenschild, Germany. 1,037,479, Sept. 3, 1912. Filed July 21, 1911. Serial No. 639,861.

Door Arrangement for Dumping Cars. E. W. Summers, Pittsburgh, Penn. 1,038,228, Sept. 10, 1912. Filed Oct. 8, 1908. Serial No. 456,809.

Automatic Stoker. S. S. Howell, assignor to Underfeed Stoker Co., Chicago, Ill. 1,037,913, Sept. 10, 1912. Filed Nov. 14, 1908. Serial No. 462,570.

Gas Producer. J. H. Hirt, El Paso, Tex., assignor to Allis-Chalmers Co., Milwaukee, Wis. 1,038,582, Sept. 17, 1912. Filed Feb. 14, 1910. Serial No. 543,721.

Retort Coke Oven System. E. W. King, Syracuse, N. Y., assignor to Semet-Solvay Co., Syracuse, N. Y. 1,038,762, Sept. 17, 1912. Filed Jan. 12, 1910. Serial No. 537,619.

Process for Briqueting Flue Dust and the article of manufacture produced thereby. R. Hubner, Elizabeth, N. J. 1,038,370, Sept. 10, 1912. Filed June 21, 1911. Serial No. 634,576.

FOREIGN

Improvements in or relating to the Timbering of Mines. A. Schnwesig of Buer, Westfalia, Germany, 15,840 of 1912.

Improvements in Apparatus for Handling Ore. Brown Hoisting Machinery Co., Cleveland, Ohio, U. S. A. 19,676 of 1911.

Improvements in and relating to Safety Lamps. A. L. Tombelaine, Vallannora, Minas, Minas de la Reunion Spain. 241 of 1912.

Improvements in and relating to Tools for Boring Earth and Soft Rocks. A. Wolf, 7, Jochmannstrasse, Leignitz, Germany. 19,462 of 1911.

Improvements in or relating to Crushing, Pulverizing or Disintegrating Machines. R. Emmott, 6, Apple Tree Carr, Burnley, 22,097 of 1911.

Improvements relating to Regenerative Coking Ovens and the like. Societé Anonyme Burkheiser-Eloy, 66 Quai de Fragnée, Belgium. 16,226 of 1912.

A new and Improved Apparatus for Operating the Stop Mechanism of Colliery Winding Engines. J. Shrigley, 82, Talbot Road, Northampton, 4941 of 1912.

Improved Apparatus for Arresting the Descent of Pit Cages in Case of Emergency. E. Rowbotham, 60, Church St., Bloxwich, Staffordshire. 28,218 of 1911.

Improved Apparatus for Washing Coal, Ores of the Precious Metals and other Ores and Minerals. J. Dodds, 30, Earmloam Road, Rutherglen, Glasgow. 24,406 of 1911.

Improvements in Lime Cartridges for Breaking Down Coal, Rock and Other Minerals. H. L. Storey, Bailrigg, Lancaster, and J. Parkinson, Meadowside, Lancaster, 10,442 of 1912.

Method and Means for Reducing or Limiting the Effects of Explosions in Coal and other Mines. J. F. Balfour, Mining Engineer, Eversley, Portobello, Edinburgh. 18,210 of 1911.

Improvements in Device for the Prevention of Overspeeding and Overwinding in Colliery Winding Engines, Hoists and the like. J. W. Teale, Hazel Villa, Car Craft, near Doncaster. 18,624 of 1911.

Coal Trade Reviews

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

The heavy demand for anthracite has gradually swung onto bituminous, and the situation in this branch is now fully as tight as in hard coal. This is ascribed in both instances as due to the paucity of cars and labor.

The warm weather of last week gave a welcome respite to the hard-coal dealers who are being taxed to the limit all over the country. The retailers are exerting every effort to keep their customers satisfied and the operating companies appear to be handling the shortage in a satisfactory manner. When the Western and Lake trade closes for the winter, and the tonnages to the East begin to show some indication of satisfying the demand, many orders, now placed in duplicate, will be withdrawn and the market may experience a sharp recession.

In bituminous the heavy movement of other traffic is effecting shipments to tide and the congestion is growing worse; there is also a deficiency in both the car and labor supply. Tonnages of all kinds are being detained, prices are correspondingly firmer and consumers have good reason to be concerned over the outlook. In the better grades practically no free coal is to be had and operators are pushed to meet their obligations. Some are badly tied up with low-price contracts, but there is so much new business that all the companies are doing well. Both the demand and prices are showing a steady increase.

In Ohio the production is only about 40 to 50 per cent. normal and the trade is entirely at the mercy of the car supply. The new circular of Oct. 1 is being maintained in every particular. Dealers are clamoring for coal and every effort is being made to cover, while manufacturers are also attempting to store but without much success. Slightly larger tonnages are going into the Northwest. In the South the lack of equipment, especially on the Illinois Central, has handicapped production, while the demand and prices are steadily improving.

The Middlewestern mines are working fully up to the limit of the car and labor supply, the market is practically denuded of stocks and prices are buoyant. Some buyers have refused to believe the rumors of a shortage were genuine and are taking their chances on obtaining tonnages. But others regard the situation as serious and are eagerly seeking to cover their requirements.

Boston, Mass.

Bituminous is shortening up at all the shipping ports and prices are correspondingly firmer. The movement of other traffic east over the roads terminating at Norfolk and Newport News has affected the shipments of Pocahontas and New River to tide, and the congestion is growing worse rather than better. Tonnage of all kinds is being detained at the loading piers. The shortage of cars and the poor condition of much of the motive power is showing up all over and consumers of bituminous have good reason to be concerned over the outlook. A spot market has developed in a mild way at Philadelphia and New York, and $3@3.10 is an easy sale on ordinary Pennsylvania grades. The Georges Creek shippers are barely able to look after contracts and have practically no supply for the open market.

Anthracite has been marking time this week, the warm weather having given a welcome respite to the retailers, and therefore somewhat relieved the pressure on the wholesale trade. In Boston the retail price was advanced 50c. on all sizes, Oct. 1, making broken $7.50, egg $8, with stove and chestnut $8.25. The news caused a little flurry in the newspapers and the mayor sent for representative dealers and asked an explanation. He was assured that the shortage was temporary and that if the public would ask only what was actually needed from time to time, and not demand the whole season's supply in a lump, the situation would be easier later, and more than likely there would be a drop in price by Dec. 15.

Wholesale quotations are about as follows:

Clearfields, f.o.b. mine	$1.20@1.55
Cambrias and Somersets, f.o.b. mine	1.35@1.70
Cambrias and Somersets, f.o.b. Phila.	2.60@2.95
Pocahontas, New River f.o.b. Hampton Roads	3.00@3.25
Pocahontas, New River on cars Boston	4.20@4.35
Pocahontas, New River on cars Providence	4.15@4.25
Anthracite stove, egg, chestnut, f.o.b. N. Y.	6.45@6.75

New York

Bituminous—The New York soft-coal market has reached a point where nothing can be obtained under $2.85 and this only for the lowest grades. The Georges Creek and other better grades are entirely out of the market. None of the companies appear to be accumulating any stocks whatever, and many are experiencing a great deal of trouble in meeting their contracts, the requirements on which are up to the limit. It is clearly evident, however, that the consumers are obtaining substantial surpluses as the movement is obviously far in excess of that required for immediate consumption.

Production at the mines is still being interfered with by the scarcity of labor and the inadequate car supply. However, the movement continues good on the railroads and the arrivals at this point are probably above normal. The market is ruling firm and hard at the following quotations with only small tonnages obtainable:

West Virginia, steam	$2.80@2.90
Ordinary grades, Pennsylvania	2.90@3.00
Fair grades, Pennsylvania	2.85@2.95
Good grades, Pennsylvania	3.00@3.10
Best Miller, Pennsylvania	3.15@3.25
Georges Creek	3.50

Anthracite—No new features have developed in the hard-coal market, which continues strong and active, with a possible further tightening of the situation due to the recent cold snap. Production at the mines is being handicapped by the insufficiency of labor and cars, but on the other hand it is stated that the companies are beginning to withdraw tonnages from the line and Western trade and diverting these into the Eastern market which should tend to materially help the situation here. When the Lakes are finally closed to navigation the operators state they will be able to effect a complete relief in the Eastern market.

The steam sizes of the lower grades are still a drug on the market due to the weather conditions. On the other hand New York retailers, have, in a few instances, paid premiums of $1.30, but only in extreme cases. The companies believe that the present shortage is due entirely to the desire on the part of the consumer to lay in his entire winter's supply at once. If they would be satisfied with small periodical allotments sufficient to keep them going, it is believed the panicky feeling would be eliminated. However, buyers appear to be too anxious, or regard the outlook as too serious to delay in obtaining their supplies.

Quotations have increased further, the market being as follows:

	Upper Ports	Lower Ports
Broken	$5.00	$4.95 @ 5.75
Egg	5.25	5.20 @ 6.25
Stove	5.25	5.20 @ 6.25
Nut	5.50	5.45 @ 6.25
Pea	3.50	3.35 @ 3.75
Buckwheat	2.75	2.25 @ 2.45
Rice	2.25	1.95 @ 2.05
Barley	1.75	1.60 @ 1.70

Pittsburgh, Penn.

Bituminous—Production at the mines is being seriously handicapped by the inadequate car supply, which is only about one-third normal. This is the lowest point so far reached this season, and the worst feature of the situation is that the railroad officials are unable to promise any immediate improvement. Mines are in a position to dispose of full tonnages, but those most favorably located are only able to work about half time.

No spot business is being done whatever, the only transactions being those based on shipments after the first of the year. While only small tonnages are to be had, we continue former quotations: Mine-run and nut, $1.10@1.15; ¾-in., $1.30; 1¼-in., $1.40; slack, 70@80c. per ton at mine, Pittsburgh district.

Connellsville Coke—The car shortage in the coke region has become so acute that prices have advanced rapidly, and the market is assuming famine proportions. Shipments on many contracts are short, and furnaces are being forced into the open market to bid for prompt coke. The situation is being further aggravated by several idle furnaces, which are preparing to go into blast and are endeavoring to buy for the balance of the year.

Prompt furnace readily commands $3 and higher, while first-half contracts are being made at $2.70@3. Contract foundry is quoted at $3. The labor shortage has been further accentuated by the foreign wars, many of the men in the coke regions having left to participate in the Balkan trouble, with the result that production is now less than 400,000 tons per week.

The *Courier* reports production in the Connellsville and Lower Connellsville region in the week ending Sept. 28, at 382,627 tons, an increase of 8996 tons, and shipments at 3942 cars to Pittsburgh, 6400 cars to points west and 826 cars to points east, a total of 11,168 cars, showing an increase of 163 for the week.

Philadelphia, Penn.

A return of warm weather in this locality caused an easing up of the heavy demand that is being made on the retail dealers, although only to a trifling extent. Cold snaps have the effect of compelling householders to turn their attention toward their coal bins, but the return of anything like warm weather, again lessens the demand. While several of the large cities have advanced their retail prices to almost prohibitive figures, there has been no change here. Arguments are advanced that placing the figures high will have the effect of easing the situation, and exclude unnecessary orders. Every scare head in the newspapers about the threatened scarcity of coal causes a new rush to the dealers.

It is, to say the least, a rather difficult proposition to turn down an order for 10 or 15 tons, when the cash is laid down alongside of it, but some of the dealers are doing it, and in some cases, where it is new trade, the orders are refused outright, or perhaps only one or two tons promised. The dealers are endeavoring to meet a trying situation to the best of their ability, and it is only the individuals who are trying to "hog" it, that are having trouble in getting their orders filled. One and two lots are being given within a reasonable period, and it is safe to say that there was not the slightest discomfort experienced during the last cold snap.

Premiums are being paid, and as high as $4.75 at the mines is being offered for egg. Considerable speculation is going on, it is acknowledged, but not to the extent that one would think, judging by some published reports. One transaction is likely to be accepted as a general market condition, but taking the trade as a whole, circular prices are the only figures that are being paid for the greater part of the production. It depends altogether on how anxious the buyer is for the coal, what the price is likely to be..

Baltimore, Md.

The demand in the Baltimore market during the past week far exceeded the supply. There was practically no free coal to be had at any price, and operators were pushed to take care of existing contracts, owing to the continued shortage of cars. Every large consumer who could, increased his contract order for fear that he would not be able to get fuel later on.

The extraordinary demand during the week sent prices even higher than the week previous. Very little low-grade coal sold for less than $1.25 per ton, and one large operator stated that he disposed of all he could get from the mines at $1.30 and better. The next best grades are bringing prices ranging from $1.60 to $2, while Georges Creek is sold freely at $2.15 and $2.25.

The car situation did not improve much during the week, although the movement from the West Virginia fields to tidewater was somewhat better. Improvement was especially noticeable on the Western Maryland, where tie-ups at Hagerstown and other important points have been delaying coal deliveries through this port.

The total coal tonnage of the B. & O. R.R. for August was 2,919,911 as compared with 2,651,848 tons for the corresponding period of 1911, an increase for August of this year of 268,963 tons. The coke tonnage for the month was 409,627 tons as against 347,457 tons for 1911.

The local trade reports a decided improvement in the coke business. The demand is strong at this time, and prices have advanced from 10 to 15c. per ton.

Buffalo, N. Y.

The demand for bituminous is still increasing, though just now coke is setting the pace, but, of course, coal will not be able to hold back when that is so active. In this market it is practically impossible to get any stock coke and the movement of the high-sulphur product is heavy. In fact, the different grades are just as badly mixed up and out of the ordinary as it is possible for them to be.

Bituminous operators are confronted with two difficulties, the inadequate car supply and the lack of men. Some of them are pretty badly tied up with low-priced contracts, but the demand is so much larger than was looked for that a good amount of business can be done on new orders, at an excellent profit.

If there is any anthracite lying about loose it is too bad that it cannot be put into the market right away in some form. Shippers say that their increased supply has not begun to satisfy the demand, and as soon as that happens there will be many orders canceled, for dealers have ordered of several different companies and they will withdraw all duplicates as soon as they are supplied.

Bituminous prices are quite strong at $2.60 for three-quarter, $2.50 for mine-run and $2.15 for slack, Pittsburgh quality, with Allegheny Valley 25 to 30c. lower. Coke is steadily advancing and is now quotable at $5.10 for best Connellsville foundry, with no stock coke in sight.

Anthracite shipments by lake from Buffalo to Oct. 1 were 2,464,354 tons, as against 2,910,819 tons to date last season. September shipments were 681,425 tons, which was much above the average in former seasons.

Columbus, Ohio

The coal trade in Ohio is now entirely at the mercy of the car supply, with the result that prices are ruling firm in every grade and the output is from 40 to 50 per cent. of normal. The car situation is growing worse instead of better, and there is no immediate hope for an improvement. In fact, everyone believes that it will grow worse instead of better and bad times are anticipated in the near future.

The new circular, which became effective Oct. 1, is now being maintained in every particular. There is no cutting of prices to force the market, and the tendency of quotations is upward. There is much speculation of a still further advance in the circular after Oct. 15, but this is not settled yet. The next jump will be to $2 per ton, and that price is probably not far distant now.

Dealers are clamoring for coal and every effort is being made by the retail trade to cover. They are stocking up on both fancy grades and in Hocking lump. Consumers are buying in larger quanti-

ties, having in mind their experiences of last winter, when they ran short before the cold weather was half over. The retail price has advanced and still further increases are expected soon.

The steam trade continues firm in every way, and the tonnage requirements of some of the larger factories is increasing. Business conditions generally show improvement, despite the presidential election, and this means a larger fuel consumption. Many of the manufacturing establishments are trying to store steam grades, but the lack of cars is making this difficult.

The Lake trade is still active, and the tonnage into Toledo, for shipment to the Northwest, is slightly larger, in spite of the short car supply. During the week ending Oct. 4, the Toledo docks of the Hocking Valley Ry. loaded 53,000 tons. There is a good demand for coal in the Northwest, and the dock owners are making frantic efforts to secure shipments.

Quotations in the Ohio fields are:

	Hocking	Pittsburgh	Pomeroy	Kanawha
Domestic lump	$1.75		$2.00	$1.75
3-in.	1.55	$1.20	1.75	1.55
Nut	1.25		1.50	
Mine-run	1.30	1.05	1.50	1.30
Nut, pea and slack	0.90		1.00	0.75
Coarse slack	0.75	0.80	0.90	0.65

Hampton Roads, Va.

The past week has been comparatively quiet at Hampton Roads. Considerably more coal was dumped over the three piers than a few weeks ago. This extra tonnage was handled without any friction or interruption. Shippers are being pressed for all the coal they can produce to keep up with their regular business. In fact, inquiries are in the market for high volatile coal from consumers who ordinarily used only the smokeless.

Figures showing the coal dumped over the Hampton Roads coal piers during the month of September again fall short of expectations. While the Virginian Ry. piers, at Sewalls Point, established a new record for loading of 242,880 tons, both the Norfolk & Western and Chesapeake & Ohio piers fell below their usual proportion. The former handled 404,016 tons and the latter 289,492 tons; altogether, 936,388 tons. Shippers confidently expected that the dumping for September would aggregate a million tons.

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Railroad car shortage is interfering with the production. The demand is so strong that the operators are endeavoring to keep the mines in full operation and are urging roads to furnish equipment promptly. Good prices obtain, ranging from $1.25 to $1.50 per ton and more.

So far, little coal or coke has been accumulated. As was stated some time back, one or two of the larger companies in this section proposed an accumulation of coal and coke to care for the activity at the iron and steel plants, but so far there has been none put into bins. Coke is in good demand with prices a shade lower since the byproduct output has been increased so materially.

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The coal-mining industry in Indiana has been considerably handicapped during the past week, owing to the lack of sufficient cars. The demand is unusually good and nearly all, if not quite all, the miners are employed when cars can be had. The threatened shortage is here, notwithstanding the many precautions taken to guard against it. The State Railroad Commission has been appealed to and will take a hand in the matter the coming week.

Indianapolis dealers have advanced the price of anthracite, Pocahontas and some other coals 50c. a ton. They usually raise prices Oct. 1 in preparation for the larger demand, but this year they began to raise them in mid-summer, and it was hoped by many consumers as well as dealers that this would do away with the October raise. The local supply of all these coals, and also of soft coal, is small. Every effort is being made to replenish storehouses all over the state. The operators are exceedingly anxious to take care of this demand promptly and with continuous good weather hope to do so.

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There has been an unusually early spell of cold weather at this point which has resulted in a considerably heavier demand than could be supplied with normal equipment. The district has also been greatly handicapped by the lack of sufficient equipment for loading on the Illinois Central R.R. and at the operations in Illinois as well. This has resulted in the mines working only about half time. Memphis itself has not suffered from the shortage as yet. The L. & N. R.R. furnishes practically all the cars required by the trade.

Prices are practically as follows:

No. 1 lump coal	$1.25@1.35
No. 2 lump coal	1.00@1.15
No. 1 nut coal	1.00@1.10
Mine-run coal	0.80@0.90
Screenings	0.25@0.60
Western Kentucky Coal on the I. C. R. R.	
No. 1 lump	$1.45@1.60
No. 2 lump	1.15@1.30
Nut	1.10@1.20
Mine-run	0.90@1.00
Screenings	0.30@0.75

Ordinarily these two coals sell at the same price, but owing to the uncertainty of transportation on the I. C. R.R. there is less of this product in the market and consequently the price is high. Because of the uncertainty in shipments from Illinois, this coal is being given practically no consideration. The Alabama fuels are apparently all sold up and the mines are suffering severely from lack of railroad equipment. The Carbon Hill district is quoting No. 1 lump at $2 per ton; f.o.b. mine with mine-run at $1.25@1.40; the maximum price in the Cahaba field is $3 f.o.b. mine and operators are far behind on orders.

Detroit, Mich.

The market has tightened quite noticeably during the past week, and prices have advanced sharply. The impending car shortage has induced a number of consumers to stock up, who would have otherwise waited, and taken a chance on a belated winter and an increased supply of fuel arriving. There were buyers who refused to believe that the shortage was genuine and who still hold out, awaiting a break in the market with a possible chance to pick up some cheap coal.

The anthracite shortage was even greater than was expected it would be so early. Practically none of this product is arriving, and the retail price has reached $9.50 per ton generally, while it is predicted that it will go as high as $12 before long.

Coke is commanding $6, and in some cases as high as $7 per ton, and many consumers who ordinarily used hard coal have resorted to this product in their hour of need.

Present market conditions are as follows:

	W.Va.	Pittsburgh No. 8	Pocahontas	Hocking
Domestic lump	$1.65	$1.65	$2.50	$1.65
Lump and egg	1.40	1.50		1.40
3-lump	1.45	1.40		1.40
Mine-run	1.35	1.20		1.20
Nut, pea and slack	0.95	0.95		0.95

Chicago

Veterans in the trade say they have not seen such a condition in several years as now exists in the Chicago coal market. Prices are on the increase and there is a heavy demand for practically all grades. A salient feature of the market is the almost frantic rush to buy for possible future use. Good grades are bringing from $2.25 to $2.75 for domestic lump and fancy prices are being paid for several other varieties. In a number of instances exhorbitant prices are being asked to prevent buying.

In the smokeless market prices are going upward rapidly. Mine-run coal, the circular price of which is $1.25, is selling at $1.50, the mines, in 100 carload lots and at $1.60 in ten cars or less. There are only a few companies in this line capable of taking any substantial amount of spot business. The situation is being relieved to a small extent by the release of coal from the lake trade.

It is almost impossible to obtain smokeless lump and egg. The minimum price is around $2.25 at the mines and $2.50 can easily be obtained. There are a num-

ber of companies already sold up and these will now take orders only for November delivery. It is believed that the price by that time will have reached the $3 mark.

Springfield coal has jumped to $2 a ton for six-inch domestic lump. This figure represents an advance of 50c. a ton and is due to the fact that many small dealers have sold up in anticipation of a small supply of coal in proportion to immediate needs.

Prevailing prices at Chicago are:

	Sullivan Co.	Springfield	Clinton	W. Va.
4-in. lump	$2.62@2.77			
Domestic lump		$2.82	$2.52	
Egg	2.37@2.47			$4.40
Steam lump		2.12	2.27	
Mine run	2.32@2.42	1.97	1.92	3.45
Screenings	1.52@1.57	1.32	1.52	

Coke—Prices asked for coke are: Connellsville, $5.50; Wise County, $5.25; by-product, egg and stove, $4.85@5; by-product, nut, $4.85@5; gas house, $4.85.

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The past week has seen a wonderful change in the St. Louis market. With the prevailing car shortage, it is simply a question of getting the coal. Standard 2-in. coal jumped from $1.20 to $1.40, and in isolated cases has brought even more. Standard 6-in. size went as high as $1.65, Mt. Olive 6-in. brought $1.85, and Carterville $2.15.

The supply for the present week is a little bit better than it has been, and this may cause the market to weaken, although if there is a cold snap the latter part of the week, prices will again go up.

The prevailing market is:

Carterville and Franklin County	
6-in. lump	$2.00@2.25
Egg	1.75@2.00
No. 1 nut	1.50@1.60
No. 2 nut	1.35@1.45
Screenings	0.70@0.80
Mine-run	1.20@1.30
No. 1 washed	2.00@2.25
No. 2 washed	1.80@2.00
No. 3 washed	1.50@1.60
No. 4 washed	1.20@1.30
No. 5 washed	0.90@1.00
Big Muddy	
Lump and egg	$2.50
Trenton	
Lump and egg	$2.25
Mount Olive	
6-in. lump	$1.75@1.85
3x6 egg	1.40@1.50
2-in. lump	1.50@1.60
Screenings	0.40@0.50
Standard	
6-in. lump	$1.50@1.60
2x6 egg	1.20@1.30
2-in. lump	1.35@1.45
Screenings	0.25@0.35

Anthracite is out of the market, also byproduct coke. Gashouse coke is firm at $5, St. Louis. Smokeless lump is worth $4.80, St. Louis, and smokeless egg $4.65.

Portland, Ore.

The coal situation here remains practically unchanged, although there may be an increased demand for bunker coal, owing to labor troubles in the Nanaimo coal district. Should vessels find it difficult to coal at the British Columbia port, fuel will have to be taken on here or at other coast ports on the American side of the line. The eventual outcome may have a serious effect on the market and cause an advance in values, although so far no change has been felt. No Australian cargoes have yet been reported destined for this port. The weather here remains mild, whereas in Montana and Colorado it is already quite wintry.

Production and Transportation Statistics

The Car Situation

The car situation is growing steadily worse, as it was predicted it would by railway men. On Sept. 26 there was a net shortage of 17,790 freight cars reported by the lines in this country and Canada. This is about twice the shortage reported two weeks earlier, when for the first time in several years the demand for cars was greater than the supply.

The following table shows the surplus and shortages of cars on 170 roads on Sept. 26:

	Surplus	Short	Net Surplus
Box	8,351	27,294	*18,943
Flat	1,364	3,569	*2,295
Coal, gond. and hopper	6,194	11,711	*5,517
Other kinds	10,845	1,973	8,872
Total	26,754	44,547	*17,790

*Shortage.

On the corresponding date last year the net surplus of idle cars was 59,038. Two years ago it was 42,460, in 1909, 88,806, and in 1908 125,678.

Foreign Markets

Great Britain

Sept. 27—The market shows a partial improvement on freer tonnage arrivals. A good many collieries are fully booked for the present, but others are not so favorably situated; and, under these circumstances, prices for early shipment are irregular and depend upon the individual position. The demand for forward shipment is fairly good. Sellers are naming firm figures, and a fair amount of business has been arranged. Today's quotations are approximately as follows:

Best Welsh steam coal	$4.14
Seconds	3.96
Thirds	3.66
Best dry coals	3.90
Best Monmouthshire	3.72
Seconds	3.42
Best Cardiff small coal	2.52
Seconds	2.46

The prices for Cardiff coals are f.o.b. Cardiff, Penarth, or Barry, while those for Monmouthshire descriptions are f.o.b. Newport; both exclusive of wharfage, and for cash in 30 days, less 2½ per cent.

Spanish Imports

The following is a comparative statement of Spanish imports for the first seven months of this year and last year:

	1911	1912
Coal	1,225,864	1,275,379
Coke	186,459	214,079

Financial Notes

Coal Securities

The following table gives the range of various active coal securities and dividends paid during the week ending Oct. 5:

Stocks

Company	High	Low	Last
American Coal	85	85	
American Coal Prod.	97	97	97
American Coal Prod. Pref.	118	118	118
Col. Fuel & Iron	43	41	42¾
Consol. Coal of Md.	102	102	
Lehigh Valley C. Sales	260	250	
Pitts. Coal	26½	25⅝	25⅝
Pitts. Coal Pref.	98½	97	97¼
Pond Creek	24	23⅞	
Reading	176¾	172½	175⅛
Reading 1st. Pref.	89	89	89
Reading 2nd. Pref.	99	96	96½
Va. Iron C. & C	71½	66	69¾
Westmoreland Coal	81	81	

Bonds Company	Last Bid	Asked	Weeks or Last Sale	Range
Co. F. & I. Co. gen. s f g 5s.	98⅜	....	98¼	98¼
Col. Fuel gen. 6s	106¾	108½	107¼	June '12
Col. Indus. 1st & coll. 5s. gu	85¼	Sale	85	85¼
Cons. Ind. Coal Me. 1st 5s.	....	84½	85	June '11
Cons. Coal of Md. 1st and ref. 5s	....	94	93	93
Gr. Riv. Coal & C. 1st g 6s.	....	94¼	102⅜	Apr. '06
Kan. & H. C. & Co. 1st s f g 5s	97¾	98	98	June '12
Pocah Con Collier. 1st. s f 5s	85	88	86	Sept. '12
Tenn. Coal gen. 5s	101⅜	102	102	Sept. '12
Birm. Div. 1st consol. 6s.	102	103¾	103¾	Sept. '12
Tenn. Div. 1st g 6s	102	103	103⅜	July '12
Cah. C. M. Co. 1st gu g 6s	103½	110	110	Jan. '09
Utah Fuel 1st g 5s	....	....	....	....
Victor Fuel 1st s f 5s	....	85¾	86	May '12
Va. Iron Coal & Coke 1st g 5s	96½	97½	96	97

Dividends	Div.	Period	Payable
Nova Sco. S. & C.	1½	Q	Oct. 15
Nova Sco. S. & C. pref.	2	Q	Oct. 15

Alabama Consolidated Coal & Iron Co.—The interest on the $2,840,000 consolidated 5s. of this company due May 1 was defaulted.

Columbia Coal Mining Co.—All the outstanding $90,000 car trust bonds of this company, issued under the mortgage dated Sept. 1, 1905, were called for payment at par and interest on Sept. 1.

Virginia Iron, Coal & Coke Co.—Coal produced by this company is said to be of superior quality, and the New York, New Haven & Hartford R.R. has contracted for 70,000 tons per year for the next five years. The company is said to have about 120,000 acres of high-grade coal land of which less than 100 acres have so far been developed.

Colorado Fuel & Iron Co.—When this company's charter expires, Oct. 21, it is the consensus of opinion that the corporation will ask for a renewal for 20 years as allowed under the Colorado Incorporation Laws. It is thought there may be some readjustment of the relations between the Fuel & Iron Co. and the Colorado Industrial Co., but nothing that would affect the equity of stockholders unfavorably.

Consolidation Coal Co.—The New York Stock Exchange has listed $5,974,000 additional stock of this company which was offered to shareholders of record Dec. 15, 1910, at par, making total listed $25,000,000. The new stock will carry the dividend declared Sept. 30, 1912. Of the proceeds, $1,574,000 was used to purchase securities of other companies, steel sea-going barges, rolling stock, additions to plant and mine equipment and other corporate purposes, while the remaining $4,400,000 was used to acquire 100,500 acres of coal land in Pike, Letcher and Knott counties, Ky.

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Quotations in the Ohio fields are:

	Hocking	Pittsburgh	Pomeroy	Kanawha
Domestic lump	$1.75		$2.00	$1.75
2-in	1.55	$1.20	1.75	1.55
Nut	1.25		1.50	
Mine-run	1.30	1.05	1.50	1.30
Nut, pea and slack	0.90		1.00	0.75
Coarse slack	0.75	0.80	0.90	0.65

Hampton Roads, Va.

The past week has been comparatively quiet at Hampton Roads. Considerably more coal was dumped over the three piers than a few weeks ago. This extra tonnage was handled without any friction or interruption. Shippers are being pressed for all the coal they can produce to keep up with their regular business. In fact, inquiries are in the market for high volatile coal from consumers who ordinarily used only the smokeless.

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Prices are practically as follows:

No. 1 lump coal	$1.25@1.35
No. 2 lump coal	1.00@1.15
No. 1 nut coal	1.00@1.10
Mine-run coal	0.80@0.90
Screenings	0.25@0.60
Western Kentucky Coal on the I. C. R. R.	
No. 1 lump	$1.45@1.60
No. 2 lump	1.15@1.30
Nut	1.10@1.20
Mine-run	0.90@1.00
Screenings	0.30@0.75

Ordinarily these two coals sell at the same price, but owing to the uncertainty of transportation on the I. C. R.R. there is less of this product in the market and consequently the price is high. Because of the uncertainty in shipments from Illinois, this coal is being given practically no consideration. The Alabama fuels are apparently all sold up and the mines are suffering severely from lack of railroad equipment. The Carbon Hill district is quoting No. 1 lump at $2 per ton; f.o.b. mine with mine-run at $1.25@1.40; the maximum price in the Cahaba field is $3 f.o.b. mine and operators are far behind on orders.

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Coke is commanding $6, and in some cases as high as $7 per ton, and many consumers who ordinarily used hard coal have resorted to this product in their hour of need.

Present market conditions are as follows:

	W.Va.	Pittsburgh No. 8	Pocahontas	Hocking
Domestic lump	$1.65	$1.65	$2.50	$1.65
Lump and egg	1.40	1.50		1.40
2-lump	1.45	1.40		1.40
Mine-run	1.35	1.20		1.20
Nut, pea and slack	0.95	0.95		0.95

Chicago

Veterans in the trade say they have not seen such a condition in several years as now exists in the Chicago coal market. Prices are on the increase and there is a heavy demand for practically all grades. A salient feature of the market is the almost frantic rush to buy for possible future use. Good grades are bringing from $2.25 to $2.75 for domestic lump and fancy prices are being paid for several other varieties. In a number of instances exhorbitant prices are being asked to prevent buying.

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Springfield coal has jumped to $2 a ton for six-inch domestic lump. This figure represents an advance of 50c. a ton and is due to the fact that many small dealers have sold up in anticipation of a small supply of coal in proportion to immediate needs.

Prevailing prices at Chicago are:

	Sullivan Co.	Springfield	Clinton	W. Va.
4-in. lump	$2.62@2.77			
Domestic lump.		$2.82	$2.52	
Egg	2.37@2.47			$4.40
Steam lump		2.12	2.27	
Mine run	2.32@2.42	1.97	1.92	3.45
Screenings	1.52@1.57	1.32	1.52	

Coke—Prices asked for coke are: Connellsville, $5.50; Wise County, $5.25; by-product, egg and stove, $4.85@5; by-product, nut, $4.85@5; gas house, $4.85.

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The past week has seen a wonderful change in the St. Louis market. With the prevailing car shortage, it is simply a question of getting the coal. Standard 2-in. coal jumped from $1.20 to $1.40, and in isolated cases has brought even more. Standard 6-in. size went as high as $1.65, Mt. Olive 6-in. brought $1.85, and Carterville $2.15.

The supply for the present week is a little bit better than it has been, and this may cause the market to weaken, although if there is a cold snap the latter part of the week, prices will again go up.

The prevailing market is:

Carterville and Franklin County	
6-in. lump	$2.00@2.25
Egg	1.75@2.00
No. 1 nut	1.50@1.60
No. 2 nut	1.35@1.45
Screenings	0.70@0.80
Mine-run	1.20@1.30
No. 1 washed	2.00@2.25
No. 2 washed	1.80@2.00
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No. 4 washed	1.20@1.30
No. 5 washed	0.90@1.00
Big Muddy	
Lump and egg	$2.50
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Lump and egg	$2.25
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6-in. lump	$1.75@1.85
3x6 egg	1.40@1.50
2-in. lump	1.50@1.60
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6-in. lump	$1.50@1.60
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Anthracite is out of the market, also byproduct coke. Gashouse coke is firm at $5, St. Louis. Smokeless lump is worth $4.80, St. Louis, and smokeless egg $4.65.

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Lehigh Valley C. Sales	260	250	
Pitts. Coal	26½	25⅞	25⅞
Pitts. Coal Pref.	98½	97	97¼
Pond Creek	24	23⅞	
Reading	176¼	172½	175⅛
Reading 1st. Pref.	89	89	89
Reading 2nd. Pref.	99	96	96½
Va. Iron C. & C.	71½	66	69¾
Westmoreland Coal	81	81	

Bonds Company	Last Bid	Asked	Weeks or Last	Range Sale
Co. F. & I. Co. gen. s f g 5s.	98¾	....	98¾	98¾
Col. Fuel gen. 6s	106¼	108½	107¼	June '12
Col. Indus. 1st & coll. 5s. gu.	85¼	Sale	85	85¼
Cons. Ind. Coal Me. 1st 5s.	....	84½	85	June '11
Cons. Coal of Md. 1st and ref. 5s	....	94	93	93
Gr. Riv. Coal & C. 1st g 6s.	....	94¼	102¾	Apr. '06
Kan. & H. C. & Co. 1st s f g 5s	97¾	98	98	June '12
Pocah Con Collier. 1st. s f 5s	85	88	86	Sept. '12
Tenn. Coal gen. 5s	101⅜	102	102	Sept. '12
Birm. Div. 1st consol. 6s.	102	103¾	103¾	Sept. '12
Tenn. Div. 1st g 6s	102	103	103⅜	July '12
Cah. C. M. Co. 1st gu g 6s	103½	110	110	Jan. '09
Utah Fuel 1st g 5s	....	....	....	....
Victor Fuel 1st s f 5s	....	85¼	86	May'12
Va. Iron Coal & Coke 1st g 5s	96½	97½	96	97

Dividends	Div.	Period	Payable
Nova Sco. S. & C.	1½	Q	Oct. 15
Nova Sco. S. & C. pref.	2	Q	Oct. 15

Alabama Consolidated Coal & Iron Co.—The interest on the $2,840,000 consolidated 5s. of this company due May 1 was defaulted.

Columbia Coal Mining Co.—All the outstanding $90,000 car trust bonds of this company, issued under the mortgage dated Sept. 1, 1905, were called for payment at par and interest on Sept. 1.

Virginia Iron, Coal & Coke Co.—Coal produced by this company is said to be of superior quality, and the New York, New Haven & Hartford R.R. has contracted for 70,000 tons per year for the next five years. The company is said to have about 120,000 acres of high-grade coal land of which less than 100 acres have so far been developed.

Colorado Fuel & Iron Co.—When this company's charter expires, Oct. 21, it is the consensus of opinion that the corporation will ask for a renewal for 20 years as allowed under the Colorado Incorporation Laws. It is thought there may be some readjustment of the relations between the Fuel & Iron Co. and the Colorado Industrial Co., but nothing that would affect the equity of stockholders unfavorably.

Consolidation Coal Co.—The New York Stock Exchange has listed $5,974,000 additional stock of this company which was offered to shareholders of record Dec. 15, 1910, at par, making total listed $25,000,000. The new stock will carry the dividend declared Sept. 30, 1912. Of the proceeds, $1,574,000 was used to purchase securities of other companies, steel sea-going barges, rolling stock, additions to plant and mine equipment and other corporate purposes, while the remaining $4,400,000 was used to acquire 100,500 acres of coal land in Pike, Letcher and Knott counties, Ky.

Throwing The Searchlight On Advertising

Little Talks on a Big Subject for Coal Age Readers

By the Ad. Editor

You've been hearing a lot lately about "conservation of energy."

The difference between a great and an insignificant man lies in the amount of *reserve power* he has back of him.

Napoleon, probably the world's greatest modern soldier, never let his "old guard" go into a fight unless the exigency was most urgent—he held them in *reserve* and then, at the critical moment, they swept all before them. His plan succeeded admirably until he met a man with *more reserve force* than he had.

The lungs contain a *reserve* of air that is never used—the lymphatic system is nature's reserve of *all* the forces and elements used in the human body. Men have gone without food for long periods of time simply existing on the *reserve* stored up in that lymphatic system.

The government *reserves* great forests and waterways for use by a future generation—wise men put money in *reserve* against a "rainy day." It is the *energy* we have *conserved*, lying dormant, that allows us to meet a crisis and *overcome* it.

Now consider conservation of thought and *you*. Sometime in your life an opportunity has come to you. If you've grasped it, it was only because you had the "know how"—the *reserve knowledge* to bring to bear. Another opportunity will arise probably at no far distant date, have you a reserve to meet *that*?

What is the answer? Study. And what you learn, *conserve*. Books, lectures, periodicals, all are excellent, but in *your* case, you men whose future positions depend on the knowledge you have of your work and its equipment—*advertisements*.

In them you receive first news of the newer, the greater improvements in cost-cutting, result-pulling appliances. First hand information of the fight that's continually going on to improve *conditions*. And you can *depend* on the news you get in an advertisement absolutely for, through experience, manufacturers have learned that it is ruinous to them to advertise dishonestly.

So study advertising, think how it applies to *your* case—consider the products—find out if they'll *help* you—and *remember* what you read.

Some day, when the *need* arises, you'll have *conserved* knowledge—enough to *meet* the need.

It pays to advertise only because it pays to buy advertised goods